Panasonic

PROGRAMMABLE CONTROLLER

FP7 Analog Input Unit

User's Manual

[Applicable model]

High-speed/High-resolution type 4ch (Model no.AFP7AD4H)
General-purpose type 8ch (Model no.AFP7AD8)

WUME-FP7AIH-02

2014.8 | panasonic.net/id/pidsx/global

Safety Precautions

Observe the following notices to ensure personal safety or to prevent accidents.
To ensure that you use this product correctly, read this User's Manual thoroughly before use.
Make sure that you fully understand the product and information on safety.
This manual uses two safety flags to indicate different levels of danger.

WARNING

If critical situations that could lead to user's death or serious injury is assumed by mishandling of the product.

-Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
-Do not use this product in areas with inflammable gas. It could lead to an explosion.
-Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

CAUTION

If critical situations that could lead to user's injury or only property damage is assumed by mishandling of the product.

-To prevent excessive exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assured in these specifications.
-Do not dismantle or remodel the product. It could cause excessive exothermic heat or smoke generation.
-Do not touch the terminal while turning on electricity. It could lead to an electric shock.
-Use the external devices to function the emergency stop and interlock circuit.
-Connect the wires or connectors securely.
The loose connection could cause excessive exothermic heat or smoke generation.
-Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It could cause excessive exothermic heat or smoke generation.
-Do not undertake construction (such as connection and disconnection) while the power supply is on. It could lead to an electric shock.

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Introduction

Thank you for buying a Panasonic product. Before you use the product, please carefully read the installation instructions and the users manual, and understand their contents in detail to use the product properly.

Types of Manual

- There are different types of users manual for the FP7 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.
- The manuals can be downloaded on our website: http://industrial.panasonic.com/ac/e/dl_center/manual/ .

Unit name or purpose of use	Manual name	Manual code
FP7 Power Supply Unit	FP7 CPU Unit Users Manual (Hardware)	WUME-FP7CPUH
FP7 CPU Unit	FP7 CPU Unit Command Reference Manual	WUME-FP7CPUPGR
	FP7 CPU Unit Users Manual (Logging Trace Function)	WUME-FP7CPULOG
	FP7 CPU Unit Users Manual (Security Function)	WUME-FP7CPUSEC
Instructions for Built-in LAN Port	FP7 CPU Unit Users Manual (LAN Port Communication)	WUME-FP7LAN
Instructions for Built-in COM Port	FP7 series Users Manual (SCU communication)	WUME-FP7COM
FP7 Extension Cassette (Communication) (RS-232C/RS485 type)		
FP7 Extension Cassette (Communication) (Ethernet type)	FP7 series Users Manual (Communication cassette Ethernet type)	WUME-FP7CCET
FP7 Extension (Function) Cassette Analog Cassette	FP7 Analog Cassette Users Manual	WUME-FP7FCA
FP7 Digital Input/Output Unit	FP7 Digital Input/Output Unit Users Manual	WUME-FP7DIO
FP7 Analog Input Unit	FP7 Analog Input Unit Users Manual	WUME-FP7AIH
FP7 Analog Output Unit	FP7 Analog Output Unit Users Manual	WUME-FP7AOH
FP7 Thermocouple Multi-analog Input Unit	FP7 Thermocouple Multi-analog Input Unit FP7 RTD Input Unit Users Manual	WUME-FP7TCRTD
FP7 RTD Input Unit		
FP7 High-speed counter Unit	FP7 High-speed counter Unit Users Manual	WUME-FP7HSC
FP7 Pulse Output Unit	FP7 Pulse Output Unit Users Manual	WUME-FP7PG
FP7 Positioning Unit	FP7 Positioning Unit Users Manual	WUME-FP7POSP
FP7 Serial Communication Unit	FP7 series Users Manual (SCU communication)	WUME-FP7COM
PHLS System	PHLS System Users Manual	WUME-PHLS
Programming Software FPWIN GR7	FPWIN GR7 Introduction Guidance	WUME-FPWINGR7

Table of Contents

1. Unit Functions and Restrictions 1-1

1.1 Unit Functions and Operation 1-2
1.1.1 Unit Type 1-2
1.1.2 Unit Type 1-3
1.2 Basic Operation of Analog Input Processing 1-4
1.3 Restrictions on Units Combination 1-5
1.3.1 Restriction by Power Consumption 1-5
1.3.2 Applicable Versions of Unit and Software 1-5

2. Names and Functions of Parts 2-1

2.1 Analog Input Unit 2-2

3. Wiring 3-1

3.1 Wiring of Terminal Block 3-2
3.2 Connecting Analog Input 3-3
3.2.1 Precautions When Connecting Analog Input Signal 3-3
3.2.2 AFP7AD4H 3-3
3.2.3 AFP7AD8 3-5
3.3 Trigger Input Terminal TRIG Specifications 3-6

4. Unit Settings and data Reading 4-1

4.1 Confirming the I/O Number Allocations and Starting Word Number 4-2

4.1.1 Occupied I/O Area and I/O Allocations 4-2
4.1.2 Confirming the I/O Number Allocations 4-5
4.2 Option settings 4-6
4.2.1 Configuration of Analog Input unit 4-6
4.2.2 Unit Setting and Conversion Processing Time 4-9
4.3 Reading Analog Input Data 4-10
4.3.1 Reading Analog Input Data 4-10
4.4 Data Acquisition Timing 4-11

5. Conversion Characteristics of Analog Input Unit 5-1

5.1 Voltage Range 5-2
5.1.1 Voltage Input Range: -10 to +10 V (0.32 mV, 1/62,500) 5-2
5.1.2 Voltage Input Range: 0 to +10 V (0.32 mV, 1/31,250) 5-3
5.1.3 Voltage Input Range: 0 to +5 V (0.16 mV, 1/31,250) 5-3
5.1.4 Voltage input range: 1 to 5 V (0.16 mV, 1/25,000) 5-4
5.2 Current Range 5-5
5.2.1 Current Input Range: 0 to +20 mA (0.64μA, 1/31,250) 5-5
5.2.2 Current Input Range: +4 to +20 mA (0.64μA, 1/25,000) 5-5

6. Optional Settings 6-1

6.1 Average Processing Settings 6-2
6.1.1 Number of Averaging Times 6-2
6.1.2 Time Average 6-3
6.1.3 Moving Average 6-4
6.2 Offset/Gain processing 6-5
6.3 Scale Conversion 6-7
6.4 Comparison for Upper and Lower Limits 6-8
6.5 Holding Max./Min. Values 6-11

6.6 Disconnection detection 6-14

6.7 Buffer Settings 6-16

6.7.1 Overview of Buffer Function 6-16

6.7.2 Buffering by Trigger Output Relay 6-18

6.7.3 Buffering by External Input Trigger 6-20

6.7.4 Buffering Triggered by Value Change in Analog Input 6-22

6.8 Configuration by Programming 6-24

7. What to Do If an Error Occurs 7-1

7.1 What to Do If an Error Occurs (Analog Input) 7-2

7.1.1 Failure in Reading Analog Input Data 7-2

7.1.2 Unstable Analog Input Conversion Value 7-2

7.1.3 No Proper Conversion Values Obtained with Current Input 7-2

8. Specifications 8-1

8.1 Specifications 8-2

8.1.1 General Specifications 8-2

8.1.2 Performance Specifications (AFP7AD4H) 8-3

8.1.3 Performance Specifications (AFP7AD8) 8-4

8.2 I/O Allocation 8-5

8.3 List of Unit Memories 8-8

8.3.1 List of Unit Memory Number 8-8

8.4 List of Detailed Specifications of Unit Memories 8-10

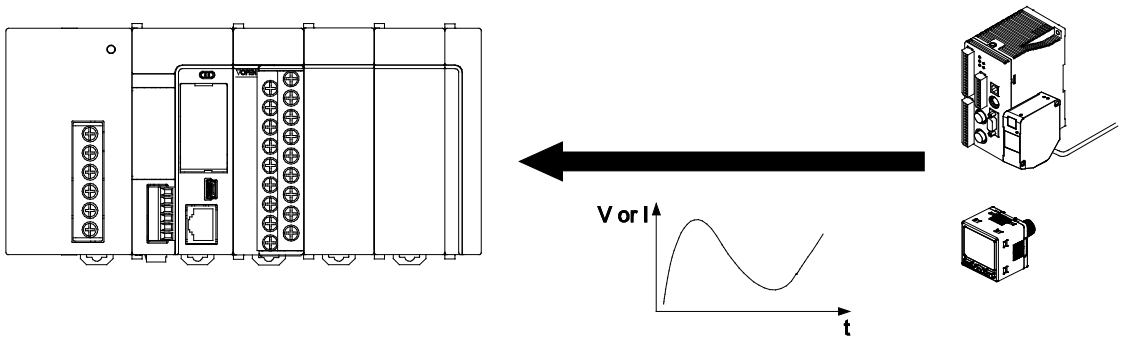
8.5 Dimensions 8-17

1

Unit Functions and Restrictions

1.1 Unit Functions and Operation

1.1.1 Unit Type



■ **Features of analog input unit**

The analog input unit receives various analog values (i.e., voltage, current, and temperature values) from laser analog sensors and pressure sensors and converts them internally into digital values.

- The analog input unit can receive input through a number of channels.
  Analog input units: 4 channels (AD4H) / 8 channels (AD8)
  Six types of input ranges can be selected to support a variety of connecting equipment.
- The speed of conversion, such as voltage/current range conversion, is as high as 25 μs/channel (non-isolated).
- Converts input analog values into digital data with up to 16 bits in a resolution range of 1/25,000 to 1/62,500.

■ **Various optional functions**

Functions to process loaded analog input data are provided. User programs can be simplified.

Function	Description
Average processing settings	Averages analog values obtained by sampling and stores them in the I/O area as digital values. It can be selected from No. of averaging times, time average and moving average.
Offset/Gain processing settings	Performs the correction of offset values (addition correct) or gain values (magnification correction), and stores the data after processing in the I/O area.
Scale conversion setting	This function is to scale-convert values to an easy-to-use data range. Converts values to digital values in the specified range (min. value and max. value), and stores the processed data in the I/O area. This function is convenient if used for unit conversion.
Upper/lower limit value comparison setting	This function compares acquired data with the upper limit and lower limit and turns ON the upper limit relay or lower limit relay if the acquired data exceeds the upper limit value or lower limit value.
Max./Min. hold setting	This function maintains the maximum and minimum values of acquired data. Holds the maximum and minimum digital conversion values when the maximum/minimum value hold setting is enabled, and stores the values in provided unit memories for each channel.
Disconnection detection	Turns ON the disconnection detection flag when input is disconnected or unconnected when selecting the range of 1-5 V 4-20 mA, and warns of the error state.
Buffer function	This function is to store digital conversion values loaded with a desired period. Any of the changes in user program, external digital input or analog input value can be selected as a trigger.

1.1.2 Unit Type

Name	Specifications		Product no.
FP7 Analog I/O Unit	Input 4ch	Voltage input range: -10 to +10 V, 0 to +5 V, 1 to +5 V, -100 to +100 mV	AFP7AD4H
	Input 8ch	Current input range: 0 to +20 mA, 4 to +20 mA	AFP7AD8

1.2 Basic Operation of Analog Input Processing

Analog input is processed as explained below.

■ **Operation of analog input unit**

(1) Receiving analog input

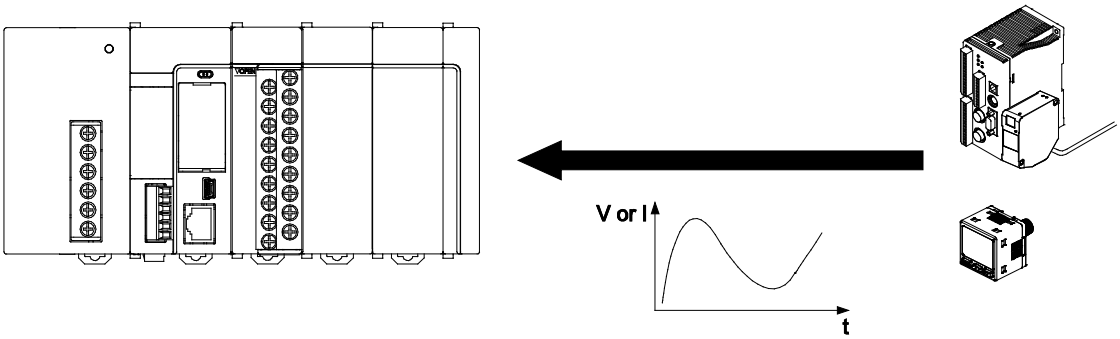
The analog input unit receives analog input data from analog devices, such as laser analog sensors and pressure sensors.

(2) Digital conversion processing

Analog input data received by the unit is converted into digital values in sequence automatically.

(3) Storage of digital values

A user program is used to read converted digital values as data in the input relay area (WX).



■ **Option setting**

The following option setting functions are provided for analog input processing. Any of the option setting functions can be set by writing the function to the unit memory (UM) by using the configuration menu of the FPWIN GR7 or a user program.

- Average processing (number of times, time average, and moving average)
- Scale conversion
- Offset/Gain processing
- Holding Max./Min.
- Comparison for upper and lower limits
- Disconnection detection
- Buffering

1.3 Restrictions on Units Combination

1.3.1 Restriction by Power Consumption

The unit has the following internal current consumption. Make sure that the total current consumption is within the capacity of the power supply with consideration of all other units used in combination with the analog input unit.

Name	Product no.	Current consumption
FP7 analog input unit (High-speed and High-accuracy type)	AFP7AD4H	100 mA or less
FP7 Analog Input Unit (General-purpose type)	AFP7AD8	85 mA or less

1.3.2 Applicable Versions of Unit and Software

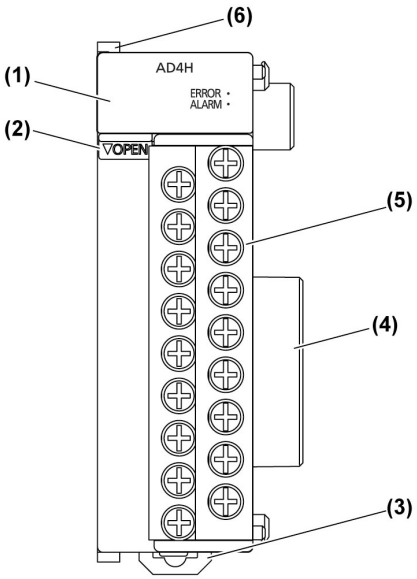
For using the above units, the following versions of CPU units and software are required.

Name	Product no.	Applicable version	
		CPU unit	FPWINGR7
FP7 Analog Input Unit (High-speed and High-accuracy type)	AFP7AD4H	Ver.1.0 or later	Ver.1.0 or later
FP7 Analog Input Unit (General-purpose type)	AFP7AD8	Ver.3.1 or later	Ver.2.4 or later

2

Names and Functions of Parts

2.1 Analog Input Unit



■ **Names and functions of parts**

(1) Operation monitor LEDs

LED name	LED color	Contents
-	Blue	Lit when the CPU unit is turned ON.
ERROR	Red	Lit if the configuration settings are beyond the allowable range or A/D conversion is not possible.
ALARM	Red	Lit if the hardware has an error.

(2) Terminal block release lever

To remove the analog input terminal block, push the release lever downward.

(3) DIN rail attachment lever

This lever is used to fix the unit to the DIN rail.

(4) Unit Connector

Connects to other I/O units and high-function units.

(5) Analog input terminal block

The terminal block is removable. Remove the terminal block before wiring.
Solderless terminals for M3 can be used.

(8) Fixing hook

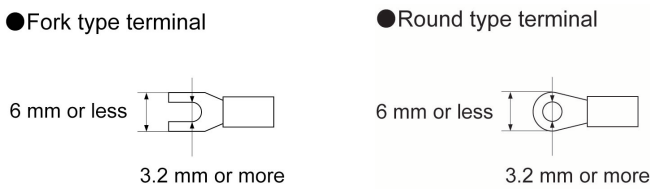
Used to secure the unit with another unit.

3
Wiring

3.1 Wiring of Terminal Block

■ Suitable solderless terminals/wires

M3 terminal screws are used for the terminal. The following suitable solderless terminals are recommended for the wiring to the terminals



• Suitable solderless terminals

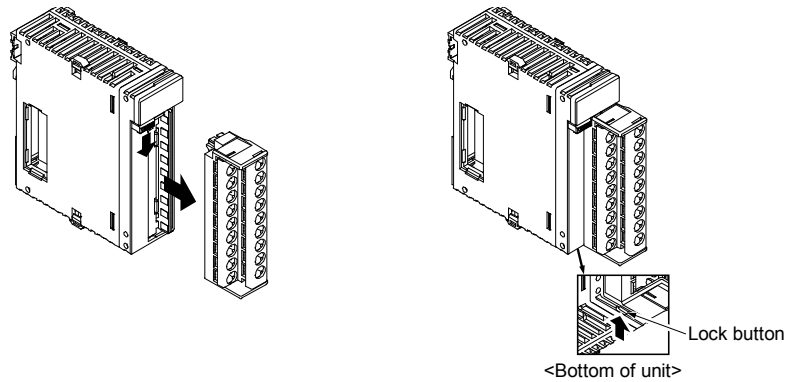
Manufacturer	Shape	Part no.	Suitable wires
J.S.T. Mfg Co., Ltd.	Round type	1.25-MS3	0.25 to 1.65 mm^2
	Fork type	1.25-B3A	
	Round type	2-MS3	1.04 to 2.63 mm^2
	Fork type	2-N3A	

• Suitable wires

Suitable wires	Tightening torque
AWG22 to 14 (0.3 mm^2 to 2.0 mm^2)	0.5 to 0.6N ·m

■ Connection to the terminal block

Remove the terminal block before beginning the wiring operations.
To remove the terminal block, push the release lever located at the top of the terminal block downward.



◆ NOTE

Install the terminal block by inserting it all the way to its original position and pressing the lock button on the bottom of the unit. Then confirm that the terminal block is securely attached and cannot be removed.

3.2 Connecting Analog Input

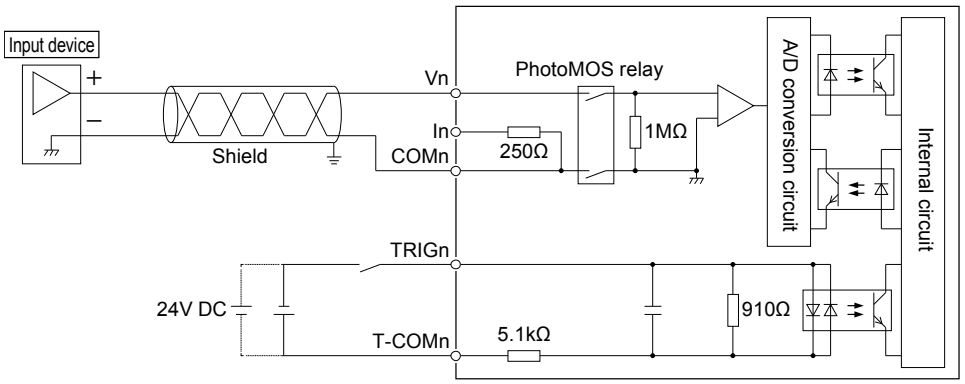
3.2.1 Precautions When Connecting Analog Input Signal

- Use double-core twisted-pair shielded wires. It is recommended to ground them. However, depending on the conditions of the external noise, it may be better not to ground the shielding.
- Do not have the analog input wiring close to AC wires, power wires, or load line from a device other than PLC. Also, do not bundle it with them.

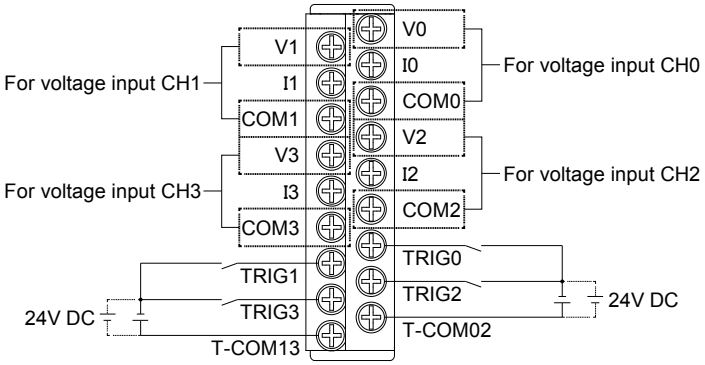
3.2.2 AFP7AD4H

- For the current input, connect the V and I terminals.
- The trigger input terminal is used for using the buffer function with external input signals as trigger signals. It does not need to be connected when this function is not used.

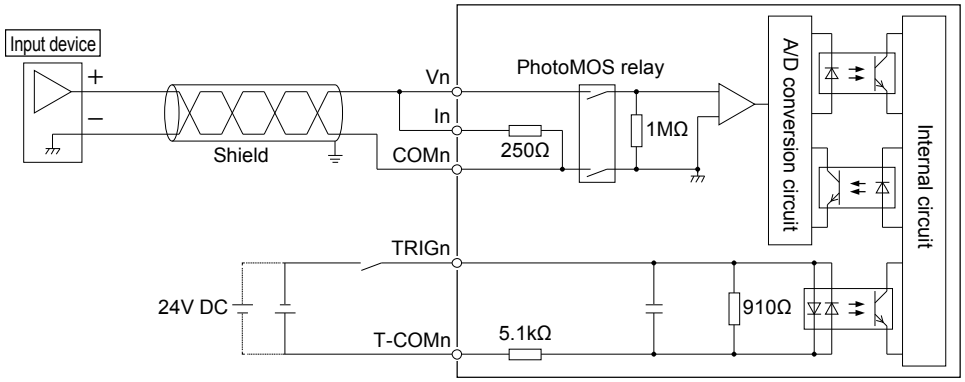
■ **Wiring Diagram and Internal Circuit Diagram (For voltage input)**



■ **Terminal layout (For voltage input)**

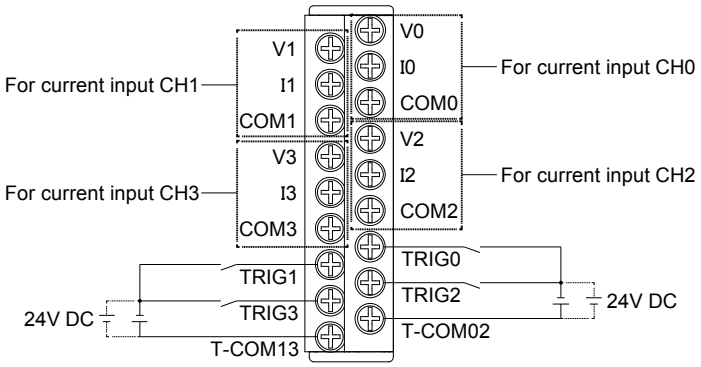


■ Wiring Diagram and Internal Circuit Diagram (For current input)



(Note) For the current input, connect the V and I terminals.

■ Terminal layout (For current input)

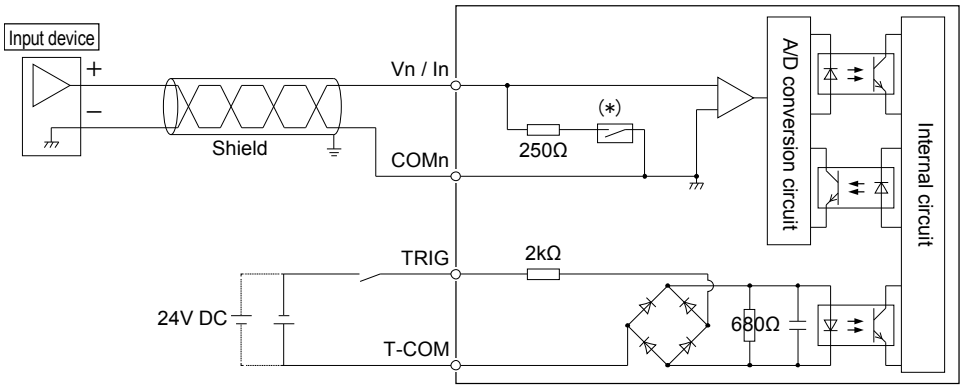


(Note 1)TRIG0 to TRIG3 of AFP7AD4H indicate input terminal numbers. Note that they do not correspond to the analog inputs "CH0 to CH3".

3.2.3 AFP7AD8

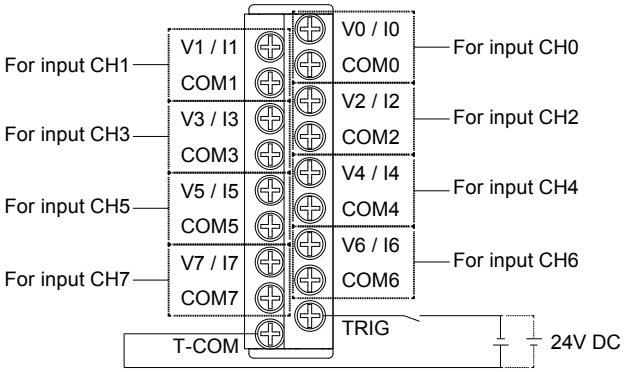
- The voltage input and the current input switched by the configuration setting.
- The trigger input terminal is used for using the buffer function with external input signals as trigger signals. It does not need to be connected when this function is not used.

■ **Wiring Diagram and Internal Circuit Diagram (For voltage input and current input)**



(*) The connection of the circuit varies according to the configuration setting.

■ **Terminal layout (For voltage input and current input)**



3.3 Trigger Input Terminal TRIG Specifications

The trigger input terminal is used when the buffer function is used with an external input signal as a trigger signal. This terminal needs not be connected if these functions are not used.

■ **Description**

Items		Description	
		AFP7AD4H	AFP7AD8
Insulation system		Optical coupler	
Rated input voltage		24 V DC	
Rated input current		Approx. 4.5 mA (at 24 V)	Approx. 12 mA (at 24 V)
Input impedance		Approx. 5.1kΩ	Approx. 2kΩ
Operating voltage range		21.6 to 26.4 V DC	
Min. ON voltage/Min. ON current		19.2 V/3.5 mA	
Max. OFF voltage/Max. OFF current		5 V/1.5 mA	
Response time	OFF→ON	0.2 ms or less	0.1 ms or less
	ON→OFF	0.2 ms or less	0.1 ms or less
Input points per common		2 point/1 common	1 point/1 common
External connection method		Terminal block connections (M3 terminal screws)	

4

Unit Settings and data Reading

4.1 Confirming the I/O Number Allocations and Starting Word Number

4.1.1 Occupied I/O Area and I/O Allocations

- Input data is allocated to the external input relay areas (WX).
- To the I/O areas of the thermocouple multi analog input unit and RTD input unit, an area to set optional functions and an area to reset errors are allocated.

■ **Input contact**

I/O area No.	Name	Default	Description
WX0	CH0 Analog conversion data	K0	Analgo conversion data area Digital converted values corresponding to the analog input is stored. <Voltage range> -10 to +10 V: -31,250 to +31,250 0 to +10 V or 0 to +5 V: 0 to +31,250 +1 to +5 V: 0 to +25,000 <Current range> 0 to +20 mA: 0 to +31,250 +4 to +20 mA: 0 to +25,000 Optional function flag area Refer to the table on the next page.
WX1	CH0 Optional function flag	H0	
WX2	CH1 Analog conversion data	K0	
WX3	CH1 Optional function flag	H0	
WX4	CH2 Analog conversion data	K0	
WX5	CH2 Optional function flag	H0	
WX6	CH3 Analog conversion data	K0	
WX7	CH3 Optional function flag	H0	
WX8	CH4 Analog conversion data	K0	
WX9	CH4 Optional function flag	H0	
WX10	CH5 Analog conversion data	K0	
WX11	CH5 Optional function flag	H0	
WX12	CH6 Analog conversion data	K0	
WX13	CH6 Optional function flag	H0	
WX14	CH7 Analog conversion data	K0	
WX15	CH7 Optional function flag	H0	

(Note 1): The I/O numbers in the table indicates offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit. Example) When the starting word number for the unit is "10", the A/D conversion data of CH0 is WX10 and the error flag is X11F.

(Note 2) It is A/D conversion data within the specified scale range when setting the scale conversion setting.

(Note 3) The digital converted value corresponding to about 2 V of analog input is displayed for channels which are not connected to input when setting the voltage range with AFP7AD8.

■ Input contact (Optional functions/Error flag area)

I/O No.								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
X10	X30	X50	X70	X90	X110	X130	X150	Disconnection detection flag	ON with disconnection detected and OFF with disconnection restored. (Valid for 1 to 5 V and 4 to 20 mA ranges only)
X11	X31	X51	X71	X91	X111	X131	X151	Upper limit comparison relay	Turns ON when the value exceeds the set upper limit.
X12	X32	X52	X72	X92	X112	X132	X152	Lower limit comparison relay	Turns OFF when the value drops below the set lower limit.
X13	X33	X53	X73	X93	X113	X133	X153	Upper/Lower limit comparison execution flag	Turns ON when the upper limit/lower limit comparison function is executed.
X14	X34	X54	X74	X94	X114	X134	X154	Not used	Do not use.
X15	X35	X55	X75	X95	X115	X135	X155	Max./Min. hold execution flag	Turns ON when the max./min. hold function is executed.
X16 to X17	X36 to X37	X56 to X57	X76 to X77	X96 to X97	X116 to X117	X136 to X137	X156 to X157	Not used	Do not use.
X18	-	-	-	-	-	-	-	Buffer function execution flag	On when the buffer function is executed.
X19	-	-	-	-	-	-	-	Buffering flag	ON when buffering starts after the trigger is accepted. OFF when the number of buffer data items is reached.
X1A	-	-	-	-	-	-	-	Buffering completion flag	ON when the shared memory has become accessible after completion of buffering. OFF on completion of buffer data reading.
X1B	-	-	-	-	-	-	-	Data before triggering enable flag	ON when the number of buffer data items before triggering has reached the set value. OFF on completion of buffer data reading.
X1C to X1E	X3C to X3E	X5C to X5E	X7C to X7E	X9C to X9E	X11C to X11E	X13C to X13E	X15C to X15E	Not used	Do not use.
X1F	X3F	X5F	X7F	X9F	X11F	X13F	X15F	Error flag	Turns ON when an error occurs

(Note 1): The I/O numbers in the table indicates offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit. Example) When the starting word number for the unit is "10", the error flag is X11F.

(Note 2) The conditions of the buffer function (i.e., the buffer function execution flag, buffering flag, buffering completion flag, and data enable flag before triggering) are allocated to the input contacts for CH0.

■ Output contact (Optional functions/Error flag area)

I/O No.								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
Y0	Y10	Y20	Y30	Y40	Y50	Y60	Y70	Disconnection detection execution relay	ON to execute the disconnection detection function. OFF to turn OFF the disconnection detection flag (Xn0). (Valid for 1 to 5 V and 4 to 20 mA ranges only)
Y1	Y11	Y21	Y31	Y41	Y51	Y61	Y71	Not used	Do not use.
Y2	Y12	Y22	Y32	Y42	Y52	Y62	Y72		
Y3	Y13	Y23	Y33	Y43	Y53	Y63	Y73	Upper/Lower limit comparison execution relay	ON to execute the function to compare the upper and lower limits. OFF to turn OFF the upper limit comparison relay (Xn1) and lower limit comparison relay (Xn2).
Y4	Y14	Y24	Y34	Y44	Y54	Y64	Y74	Not used	Do not use.
Y5	Y15	Y25	Y35	Y45	Y55	Y65	Y75	Max./Min. hold execution relay	ON to execute the max./min. hold function.
Y6	Y16	Y26	Y36	Y46	Y56	Y66	Y76	Not used	Do not use.
Y7	Y17	Y27	Y37	Y47	Y57	Y67	Y77	Not used	Do not use.
Y8	-	-	-	-	-	-	-	Buffer execution relay	When the buffer function is enabled, trigger acceptance will be permitted with the buffer execution relay turned ON.The internal state transition will be initialized with the buffer execution relay turned OFF.
Y9	-	-	-	-	-	-	-	Buffer trigger relay	If "Trigger relay" is set in trigger setting, triggering will start with the trigger relay turned ON.
YA	-	-	-	-	-	-	-	Buffer data read completion relay	ON for one scan upon completion of readign buffer data from the shared memory with a user program. Goes to the state of trigger acceptance permitted after clearing the buffer memory.
YB to YE	Y1B to Y1E	Y2B to Y2E	Y3B to Y3E	Y4B to Y4E	Y5B to Y5E	Y6B to Y6E	Y7B to Y7E	Not used	Do not use.
YF	Y1F	Y2F	Y3F	Y4F	Y5F	Y6F	Y7F	Error flag reset relay	Resets an error flag.

(Note 1): The I/O numbers in the table indicates offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit. Example) When the starting word number for the unit is "10", the disconnection detection execution relay of CH0 is Y100, and the error flag reset relay is Y10F.

(Note 2) The operation of the buvver function (consisting of the buffer execution relay, buffer trigger relay, and buffer data read completion relay) is specified by the output contacts for CH0.

4.1.2 Confirming the I/O Number Allocations

- I/O numbers and base word numbers are always necessary when writing programs. Always check to see if the numbers match the design.
- I/O numbers allocated to the analog input unit are determined by the first word number.

■ Allocations to unit

Take the following procedure to set the first word number.

◆ PROCEDURE

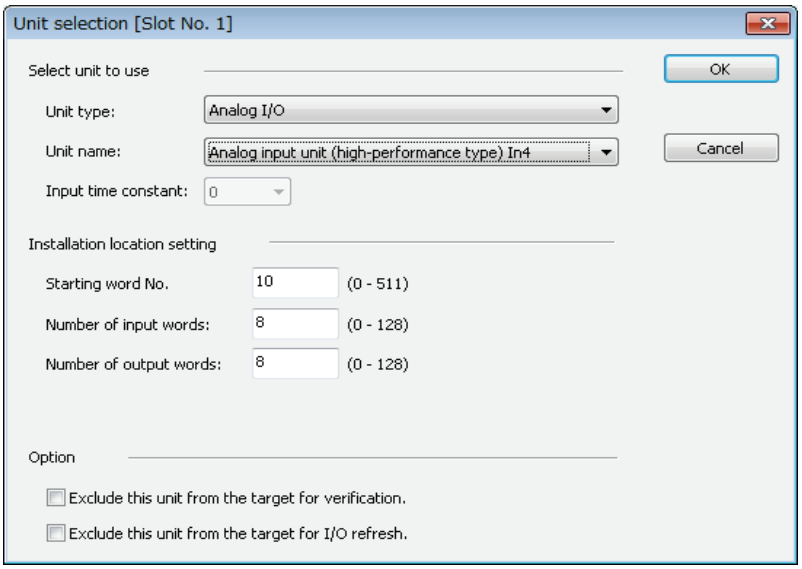
1. **Select "Options" > "FP7 Configuration" > "I/O map" in the menu bar.**

   The "I/O map" dialog box is displayed.

2. **Double-click the target slot where the operating unit is to be inserted.**

3. **Select “Analog I/O” and “Input Unit” in the unit selection field.**

   The following dialog box shows the case of AFP7AD4H.



4. **Press the [OK] button.**

   The first word number specified is set.

4.2 Option settings

4.2.1 Configuration of Analog Input unit

Use the FPWIN GR7 configuration menu to make analog input unit settings, such as input range and isolation/non-isolation settings.

■ Setting method

The following steps are described on the condition that the analog input unit has been already allocated on the I/O map.

◆ PROCEDURE

1. **Select “Options” > “FP7 Configuration” > “I/O map” from the menu bar.**

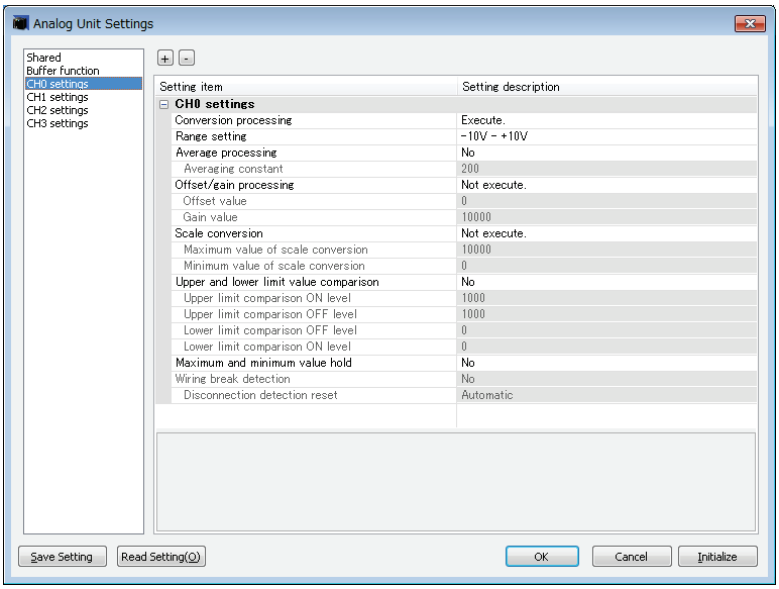
   The "I/O map" dialog box is displayed.

2. **Select the slot where the analog input unit is registered and press the [Advanced] button.**

   The “Analog unit settings” dialog box is displayed.

3. **Select a setting to be set from the left pain, and set desired items.**

   The following explanation shows the case of CH0 setting. Displayed items vary depending on the unit types and selected items.



4. **Press the [OK] button.**

   The set value will become effective when the set value is downloaded together with a corresponding program as a project.

■ **Settings (AFP7AD4H)**

Group	Setting item	Settings	Default
Basic setting items (common to all channels)	Isolation between channels	Non-isolated/Isolated	Non-isolated
	Buffer function	Not use/Use	Not use
	Trigger type	Trigger input relay/rise of external input trigger/fall of external input trigger/rising time of analog input level/falling time of analog input level	Trigger input relay
	External input trigger	Unused/TRIG0/TRIG1/TRIG2/TRIG3	Not used
	Input level trigger CH	Unused/CH0/CH1/CH2/CH3	Not used
	No. of buffer data items	1 to 10,000	1000
	No. of data items before triggering	0 to 9,999	0
	Trigger cycle	1 to 30,000	1
	Analog input trigger level	-31,250 to +31,250	0
Basic setting items (per channel)	Conversion processing	Execute/Not execute	Execute
	Range setting	-10 to +10 V 0 to +10 V 0 to +5 V +1 to +5 V 0 to +20 mA +4 to +20 mA	-10 to +10 V
Option setting items (per channel)	Average processing settings	Not execute/No. of averaging times/time average/moving average	Not execute
	Offset/Gain processing	Not execute/Execute	Not execute
	Scale conversion	Not execute/Execute	Not execute
	Comparison settings for upper and lower limits	Not execute/Execute	Not execute
	Max./Min. hold	Not execute/Execute	Not execute
	Disconnection detection settings	Not execute/Execute	Not execute
	Disconnection detection reset	Auto/Manual	Auto
	Averaging constant	Times: 2 to 60,000 [times] Time (non-isolated): 1 to 1,500 [ms] Time (isolated): 200 to 60,000 [ms] Moviing average: 2 to 2,000 [times]	200
	Offset value	-3,000 to +3,000	0
	Gain value	+9,000 to +11,000	+10,000
	Scale conversion max. value	-30,000 to +30,000	10,000
	Scale conversion min. value	-30,000 to +30,000	0
	Upper limit comparison ON level	-31,250 to +31,250	0
	Upper limit comparison OFF level	-31,250 to +31,250	0
	Lower limit comparison ON level	-31,250 to +31,250	0
	Lower limit comparison OFF level	-31,250 to +31,250	0

■ **Settings (AFP7AD8)**

Group	Setting item	Settings	Default
Basic setting items (common to all channels)	Isolation between channels	Non-isolated only	Non-isolated
	Buffer function	Not use/Use	Not use
	Trigger type	Trigger input relay/rise of external input trigger/fall of external input trigger/rising time of analog input level/falling time of analog input level	Trigger input relay
	Input level trigger CH	Unused/CH0/CH1/CH2/CH3/HC4/ CH5/CH6/CH7	Not used
	No. of buffer data items	1 to 8,000	1000
	No. of data items before triggering	0 to 7,999	0
	Trigger cycle	1 to 30,000	1
	Analog input trigger level	-31,250 to +31,250	0
Basic setting items (per channel)	Conversion processing	Execute/Not execute	Execute
	Range setting	-10 to +10 V 0 to +10 V 0 to +5 V +1 to +5 V 0 to +20 mA +4 to +20 mA	-10 to +10 V
Option setting items (per channel)	Average processing settings	Not execute/No. of averaging times/time average/moving average	Not execute
	Offset/Gain processing	Not execute/Execute	Not execute
	Scale conversion	Not execute/Execute	Not execute
	Comparison settings for upper and lower limits	Not execute/Execute	Not execute
	Max./Min. hold	Not execute/Execute	Not execute
	Disconnection detection settings	Not execute/Execute	Not execute
	Disconnection detection reset	Auto/Manual	Auto
	Averaging constant	Times: 2 to 60,000 [times] Time (non-isolated): 1 to 1,500 [ms] Time (isolated): 200 to 60,000 [ms] Moviing average: 2 to 2,000 [times]	200
	Offset value	-3,000 to +3,000	0
	Gain value	+9,000 to +11,000	+10,000
	Scale conversion max. value	-30,000 to +30,000	10,000
	Scale conversion min. value	-30,000 to +30,000	0
	Upper limit comparison ON level	-31,250 to +31,250	0
	Upper limit comparison OFF level	-31,250 to +31,250	0
	Lower limit comparison ON level	-31,250 to +31,250	0
	Lower limit comparison OFF level	-31,250 to +31,250	0

4.2.2 Unit Setting and Conversion Processing Time

Conversion time varies with the configuration setting conditions.

■ Isolation setting and conversion processing time

• Isolated: 5 ms/ch • Non-isolated: 25 µs/ch
• The speed of A/D conversion processing will become faster if non-isolation is set. Each channel is isolated by switching the respective photo-MOS relays of the channels at the time of conversion. The photo-MOS relays are always turned ON at the time of non-isolation and the commons will be shared.

- For AFP7AD8, only the non-isolated setting is available.

■ Conversion processing execution/non-execution setting and conversion processing time

Select the execution or non-execution of the conversion processing of analog input on a channel-by-channel basis. This can save the conversion time for channels that do not execute conversion processing.

Example) Conversion time for four channels

Converted in the order of ch0→ch1→ch2→ch3→ch0→ch1→ch2→ch3→.... (1 cycle = 100 µs at the time of non-isolation)

Example) Conversion time for two channels (with CH2 and CH3 excluded).

Conversion is executed in the order of ch0→ch1→ch0→ch1→ch0→ch1→ch0→ch1→... and the conversion time for CH2 and CH3, which are excluded, is saved. (1 cycle = 50 µs at the time of non-isolation)

4.3 Reading Analog Input Data

4.3.1 Reading Analog Input Data

■ Basic Operation of Analog Input Processing

(1) Receiving analog input

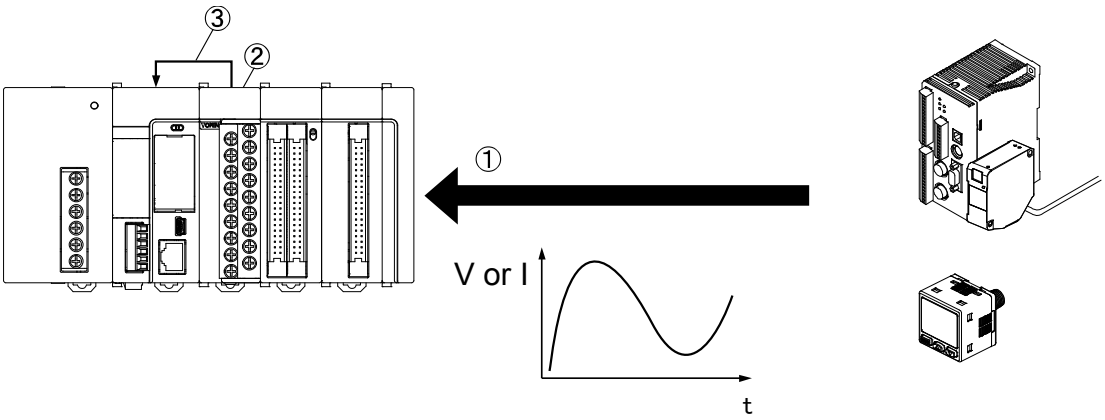
The analog input unit receives analog input data from devices, such as laser analog sensors and pressure sensors.

(2) Digital conversion processing

Analog input data received by the unit is converted into digital values in sequence automatically in the unit. The converted digital value varies with the setting of the range.

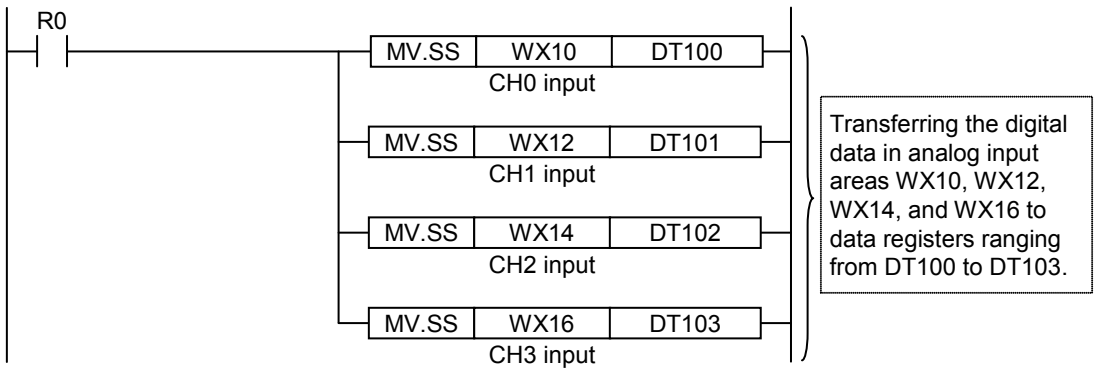
(3) Storage of digital values

A user program is used to read converted digital values as data in the input relay area (WX). The specified area number varies depending on the installation position of the unit.



■ Program to Acquire Converted Digital Values

Reading the values in digital conversion value storage areas WX10, WX12, WX14, and WX16 to any areas of data registers ranging from DT100 to DT103.


R0
MV.SS WX10 DT100
CH0 input
MV.SS WX12 DT101
CH1 input
MV.SS WX14 DT102
CH2 input
MV.SS WX16 DT103
CH3 input
Transferring the digital data in analog input areas WX10, WX12, WX14, and WX16 to data registers ranging from DT100 to DT103.

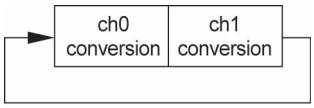
4.4 Data Acquisition Timing

■ Input conversion processing time of analog input unit

Conversion processing time varies with the range and the number of channels in use. The conversion execution/non-execution channel function can save the conversion time for channels that do not execute conversion processing.

- Example of 2-channel conversion

Converted in the order of ch0→ch1→ch0→ch1→....

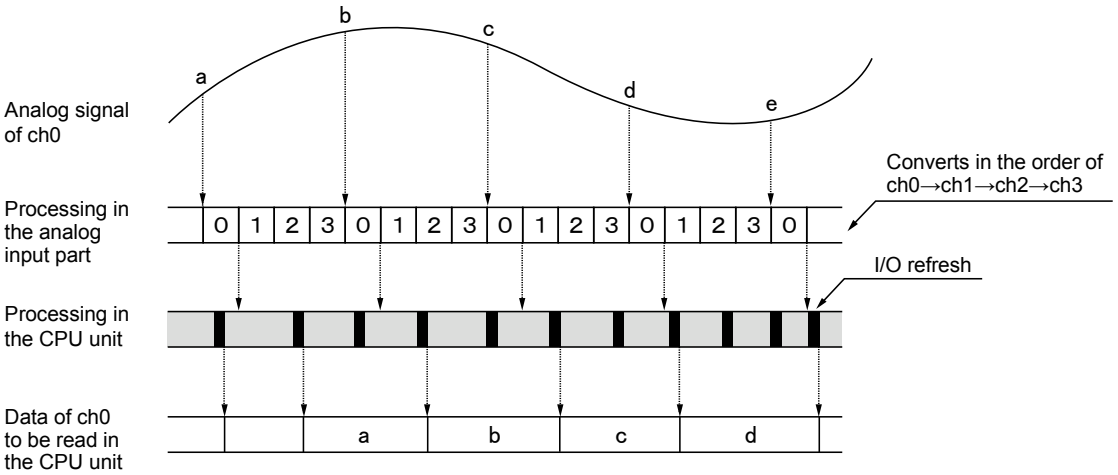


■ Data acquisition timing of CPU unit

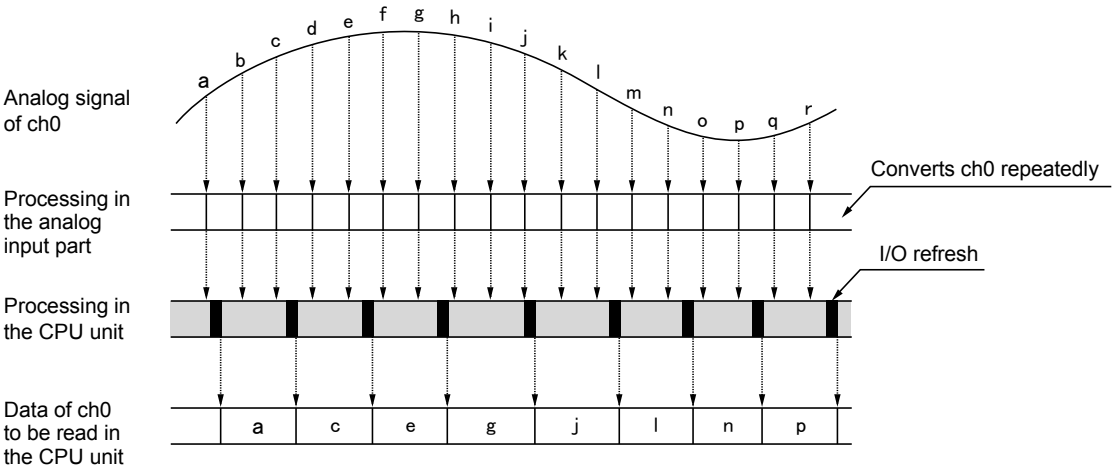
• Digital values converted by the analog input unit are input into the CPU unit at the I/O refreshing timing of the CPU unit.

• The conversion processing of the analog input unit is not synchronized with the I/O refreshing timing of the CPU unit. Therefore, the latest data is input into the operation memory of the CPU unit when the CPU unit implements I/O refreshing.

• Example of 4-channel conversion



- Example of 1-channel conversion

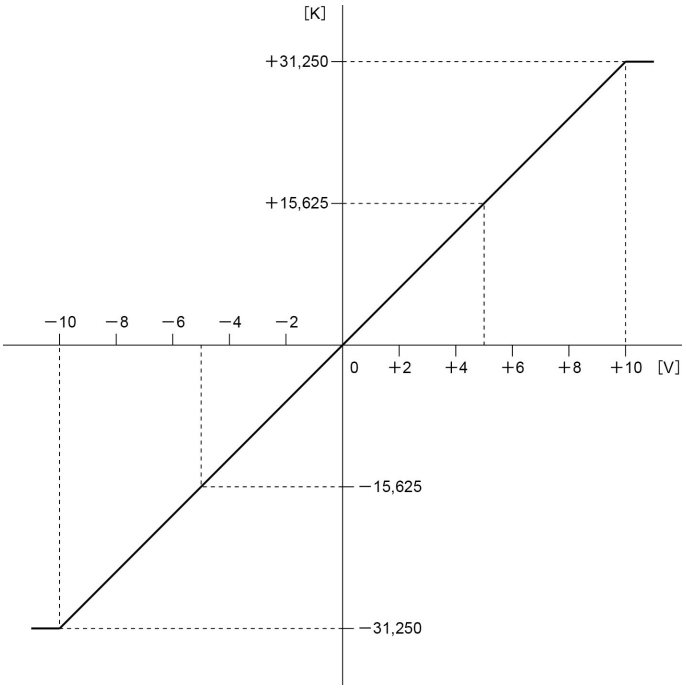


5

Conversion Characteristics of Analog Input Unit

5.1 Voltage Range

5.1.1 Voltage Input Range: -10 to +10 V (0.32 mV, 1/62,500)



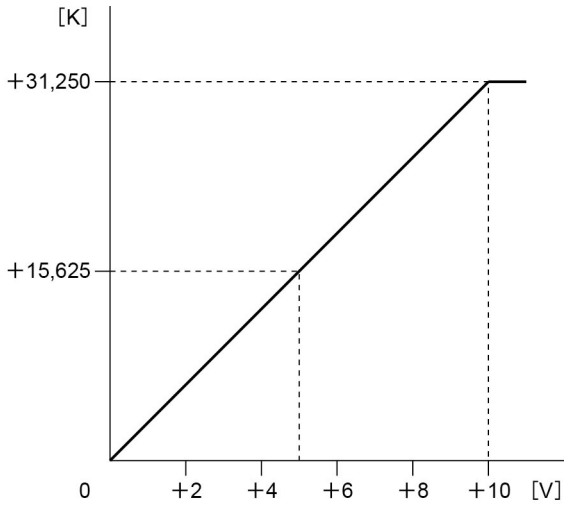
Input range: -10 to +10 V

Analog input value (V)	Digital conveted value (K)
+10	+31,250
+8	+25,000
+6	+18,750
+4	+12,500
+2	+6,250
0	0
-2	-6,250
-4	-12,500
-6	-18,750
-8	-25,000
-10	-31,250

When exceeding the rated range

Analog input value	Converted value
+10 V or more	+31,250
-10V or less	-31,250

5.1.2 Voltage Input Range: 0 to +10 V (0.32 mV, 1/31,250)



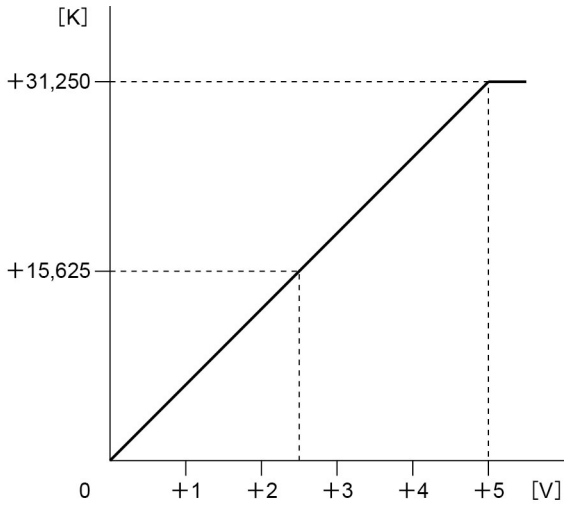
Input range: 0 to +10 V

Analog input value (V)	Digital conveted value (K)
+10	+31,250
+8	+25,000
+6	+18,750
+4	+12,500
+2	+6,250
0	0

When exceeding the rated range

Analog input value	Converted value
+10 V or more	+31,250
0 V or less	0

5.1.3 Voltage Input Range: 0 to +5 V (0.16 mV, 1/31,250)



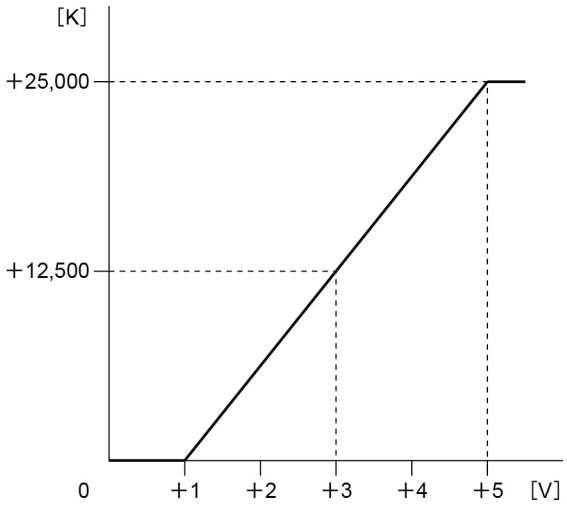
Input range: 0 to +5 V

Analog input value (V)	Digital conveted value (K)
+5	+31,250
+4	+25,000
+3	+18,750
+2	+12,500
+1	+6,250
0	0

When exceeding the rated range

Analog input value	Converted value
+5 V or more	+31,250
0 V or less	0

5.1.4 Voltage input range: 1 to 5 V (0.16 mV, 1/25,000)



Input range: 1 to 5 V

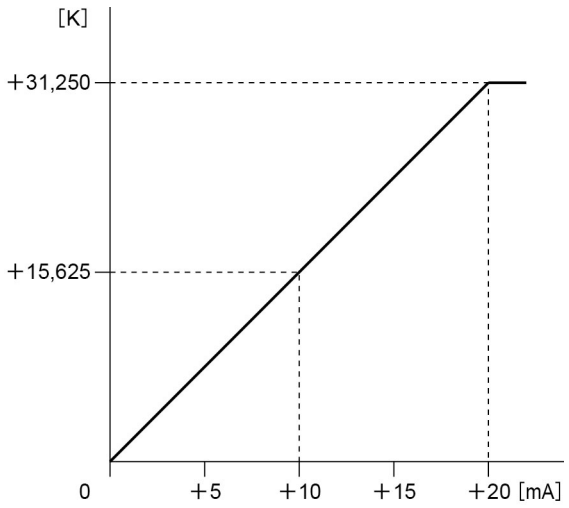
Analog input value (V)	Digital conveted value (K)
5	25,000
4	18,750
3	12,500
2	6,250
1	0

When exceeding the rated range

Analog input value	Converted value
5 V or more	25,000
1 V or less	0

5.2 Current Range

5.2.1 Current Input Range: 0 to +20 mA (0.64µA, 1/31,250)



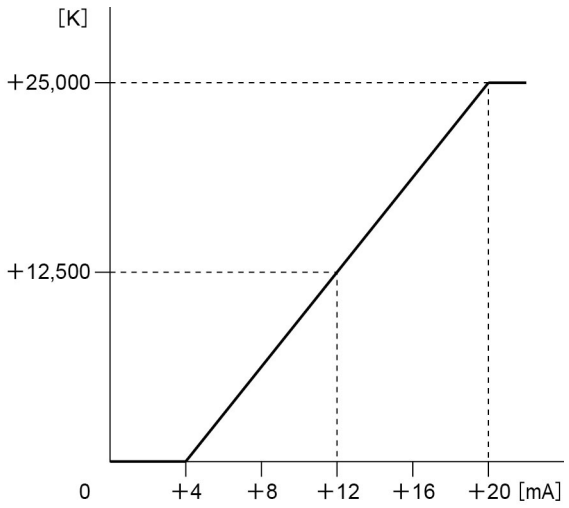
Input range: 0 to +20 mA

Analog input value (mA)	Digital conveted value (K)
+20	+31,250
+16	+25,000
+12	+18,750
+8	+12,500
+4	+6,250
0	0

When exceeding the rated range

Analog input value	Converted value
+20 mA or more	+31,250
0 mA or less	0

5.2.2 Current Input Range: +4 to +20 mA (0.64µA, 1/25,000)



Input range: +4 to +20 mA

Analog input value (mA)	Digital conveted value (K)
+20	+25,000
+16	+18,750
+12	+12,500
+8	+6,250
+4	0

When exceeding the rated range

Analog input value	Converted value
+20 mA or more	+25,000
+4 mA or less	0

6

Optional Settings

6.1 Average Processing Settings

6.1.1 Number of Averaging Times

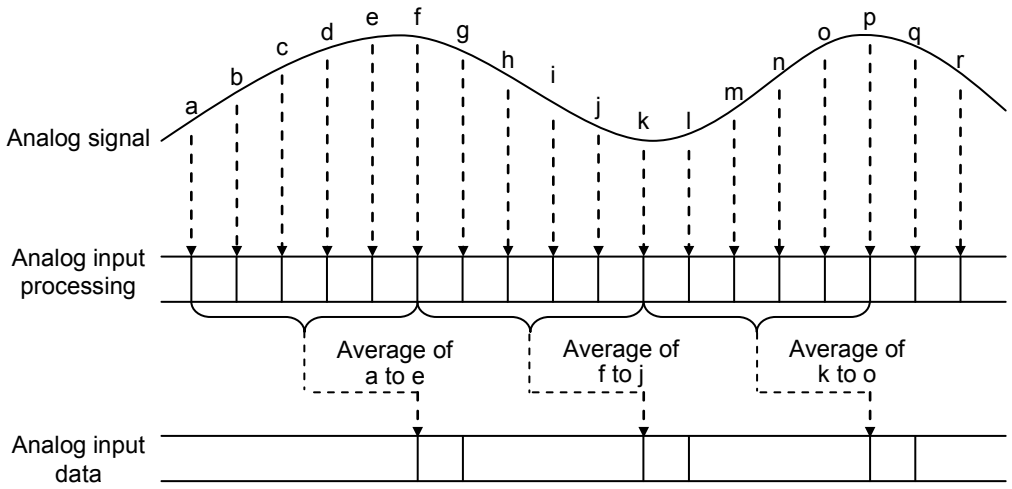
■ Overview of functions

- Analog input data sampled by the unit is averaged and stored as digital values.
- If the number of averaging times is set, analog input data items acquired will be stored as digital values when the number of analog input data items reaches the set number of averaging times.
- If the number of data items acquired is less than the number of averaging times, the acquired data will be stored in the I/O area.
- Obtain the number of averaging times to be processed from the following input.

  Input: The sum of analog input data items for the number of averaging times
  Output: Number of averaging times value

■ Processing during the number of averaging times

Averaging setting example: The number of averaging times is set to 5.



■ Configuration

Name		Default	Setting range and description
Function setting	Average processing settings	Not execute	Select “the number of averaging times.”
	Averaging constant	K200	Number: 2 to 60,000 [times] (specified with an unsigned integer)

6.1.2 Time Average

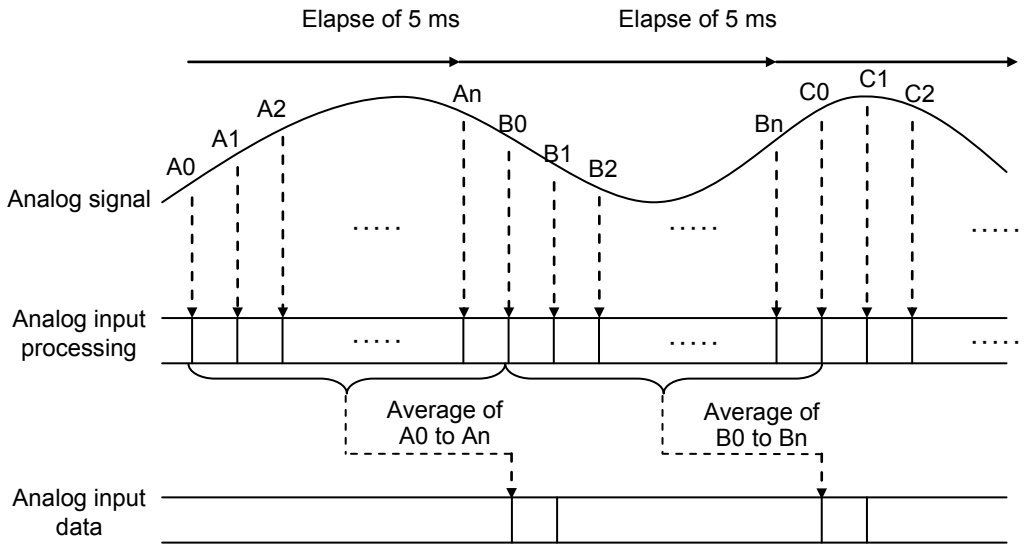
■ Overview of functions

- Analog input data sampled by the unit is averaged and stored as digital values.
- If time average is set, analog input data items acquired will be stored as digital values when the acquisition period of the analog input data items reaches the set averaging time.
- Obtain the time average to be processed from the following input.

  Input: The sum of analog input data items for the number of averaging time
  Output: Time average value

■ Processing during time average

Average setting example: Example of an averaging time of 5 ms



■ Configuration

Name		Default	Setting range and description
Function setting	Average processing settings	Not execute	Select “time average.”
	Averaging constant	K200	Time (non-isolated): 1 to 1,500 [ms] Time (isolated): 200 to 60,000 [ms] (For AD4H only) (Specified with an unsigned integer)

6.1.3 Moving Average

■ Overview of functions

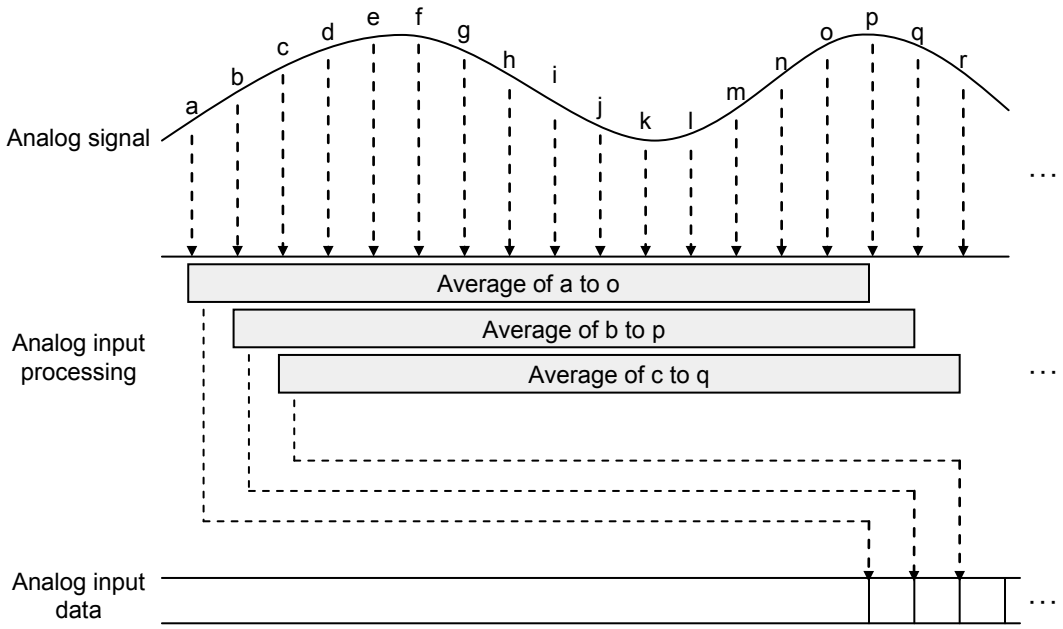
- Analog input data sampled by the unit is averaged and stored as digital values.
- If moving average is set, analog input data items acquired will be stored as digital values when the number of analog input data items reaches the set number of moving average times.
- Obtain the number of averaging times to be processed from the following input.

  Input: The number of average times, analog input data for the number of average times, the latest analog input data, and old analog input data

  Output: Moving average value

■ Processing during moving average

Averaging setting example: The number of averaging times is set to 15.



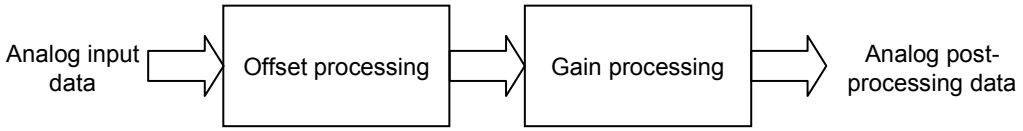
■ Configuration

Name		Default	Setting range and description
Function setting	Average processing settings	Not execute	Select “moving average.”
	Averaging constant	K200	2 to 2,000 [times] (specified with an unsigned integer)

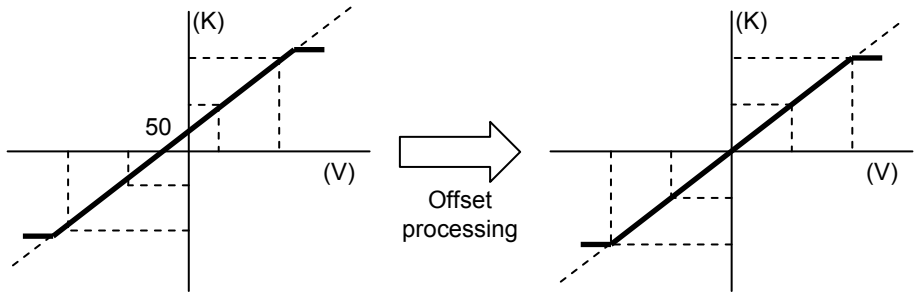
6.2 Offset/Gain processing

■ **Overview of Functions**

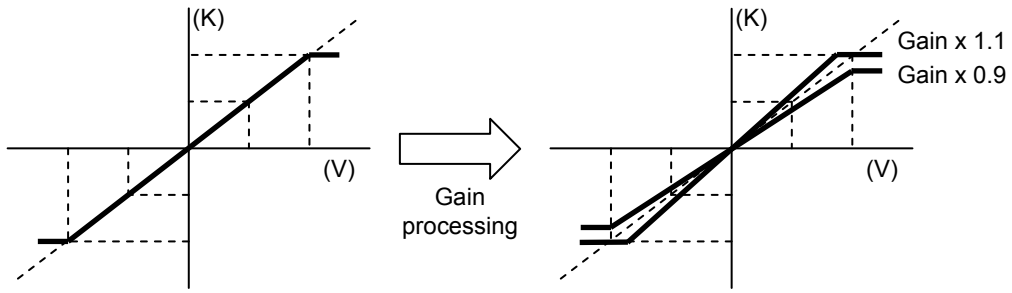
- Offset value (added correction) and gain value (magnification correction) adjustments are made to store processed data in the I/O area.



- Offset value settings are used as a function (zero-point adjustment) to make offset error adjustments between load devices. If the analog conversion value is K50 when the analog input value is 0 V, the analog conversion data is corrected to 0 V based on K-50 as an offset value.



- Gain value settings are used as a function to adjust delicate scale errors between load devices. The gain value slope can be changed in a range of x0.9 to x1.1.



- Offset/Gain processing is executed on a channel-by-channel basis.

■ **Configuration**

Name		Default	Setting range and description
Function setting	Offset/Gain processing	Not execute	Select “Execute.”
Offset value		K0	Set an offset value at the time of using the offset processing function. Setting range: -3,000 to +3,000 (specified with a signed integer)
Gain value		K10,000	Set an gain value at the time of using the gain processing function. Setting range: +9,000 to 1+1,000 (0.9x to 1.1x: Specified with a signed integer)

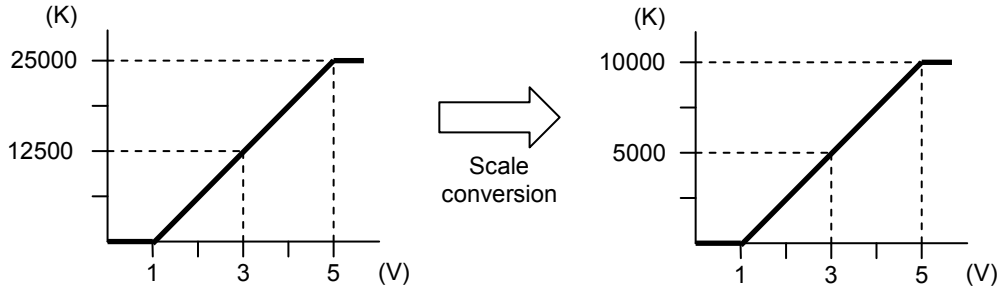
◆ NOTE

The offset value is corrected to a value corresponding to the resolution of the input range of the original value regardless of whether scale conversion is set or not.

6.3 Scale Conversion

■ Overview of functions

- This function is to scale-convert values to an easy-to-use data range. It converts values to digital values in the specified range (min. value and max. value), and stores the processed data in the I/O area. This function is convenient if used for unit conversion.
- Scale conversion is executed on a channel-by-channel basis.
- Conversion values read from the analog input unit include fractions. Therefore, convert the values to easy-to-handle figures if needed.



■ Configuration

Name		Default	Setting range and description
Function setting	Scale conversion	Not execute	Select “Execute.”
Minimum value of scale conversion		K0	Set the minimum value at the time of using the scale conversion function. Setting range: -30,000 to +30,000 (specified with a signed integer)
Maximum value of scale conversion		K10,000	Set the maximum value at the time of using the scale conversion function. Setting range: -30,000 to +30,000 (specified with a signed integer)

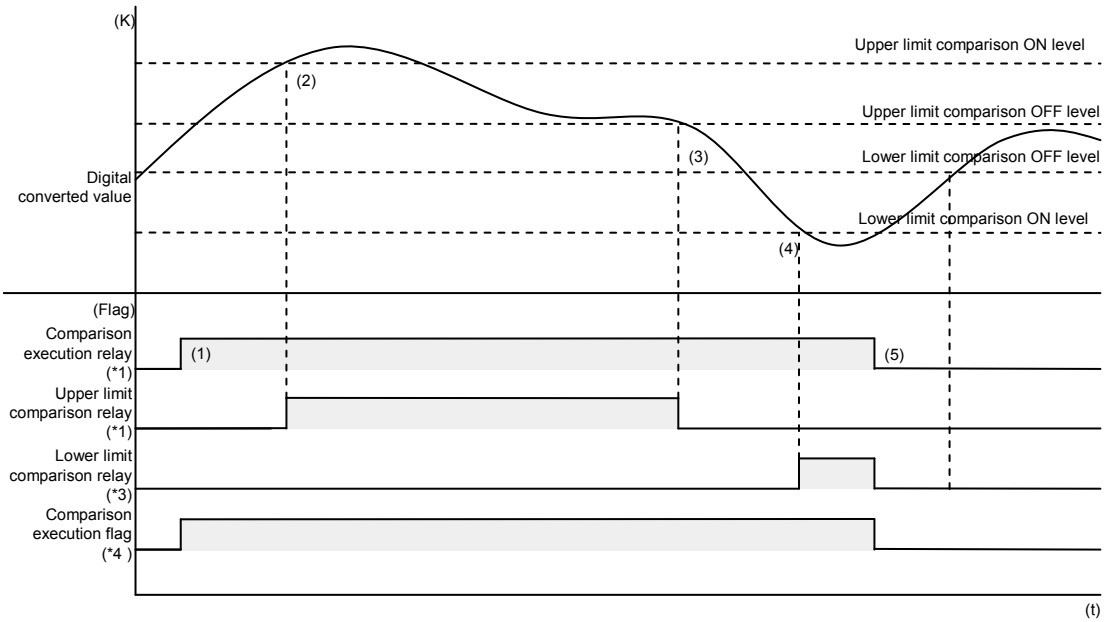
* If data outside the minimum or maximum scale is input, scale conversion will be disabled and the minimum or maximum scale value will be stored as a conversion value.

6.4 Comparison for Upper and Lower Limits

■ Overview of Functions

This function compares acquired data with the upper limit and lower limit and turns ON the upper limit relay or lower limit relay if the acquired data exceeds the upper limit value or lower limit value.

- Comparison for upper and lower limits is executed on a channel-by-channel basis.
- The upper limit relay will turn ON if the digital conversion value is larger than the upper limit.
- The lower limit relay will turn ON if the digital conversion value is smaller than the lower limit.
- The function will be disabled with the comparison execution relay (Y) turned ON if the configuration-upper/lower limit comparison setting is not executed.



(1) The upper/lower limit comparison function will be executed when the user program turns ON the comparison execution relay.

(2) The upper limit comparison relay will turn ON if the upper limit comparison ON level or an upper level is detected

(3) The upper limit comparison relay will turn OFF if the upper limit comparison OFF level or a lower level is detected.

(4) The lower limit comparison relay will turn ON if the lower limit comparison ON level or a lower level is detected.

(5) The upper/lower limit comparison relay and comparison execution flag will be forcibly turned OFF if the comparison execution relay is turned OFF.

■ I/O Allocation

The I/O numbers in the timing chart and program are shown on the condition that the first word number of the unit is 10. Actual I/O numbers allocated to the analog input unit are determined by the first word number.

	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7
*1 Comparison execution relay	Y103	Y113	Y123	Y133	Y143	Y153	Y163	Y173
*2 Upper limit comparison relay	X111	X131	X151	X171	X191	X211	X231	X251
*3 Lower limit comparison relay	X112	X132	X152	X172	X192	X212	X232	X252
*4 Comparison execution flag	X113	X133	X153	X173	X193	X213	X233	X253

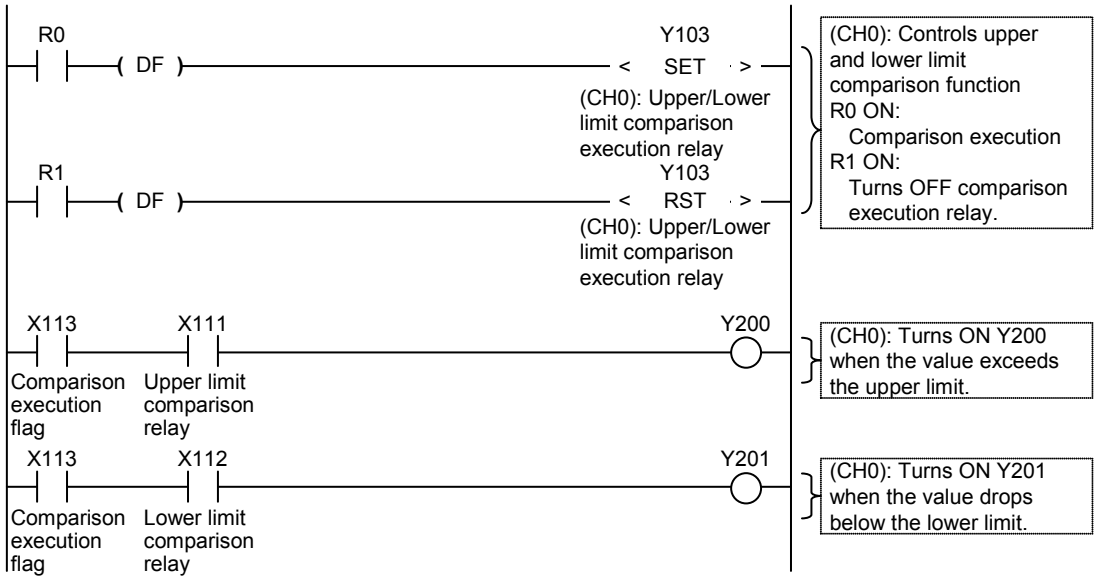
■ Configuration

Name		Default	Setting range and description
Function setting	Upper limit / Lower limit comparison	Not execute	Select the desired function to be used.
Upper/Lower limit comparison Upper limit comparison ON level		K0	Set the upper limit to turn ON the output flag at the time of using the upper/lower limit comparison function. Setting range: -31,250 to +31,250 (specified with a signed integer)
Upper/Lower limit comparison Upper limit comparison OFF level		K0	Set the upper limit to turn OFF the output flag at the time of using the upper/lower limit comparison function. Setting range: -31,250 to +31,250 (specified with a signed integer)
Upper/Lower limit comparison Lower limit comparison OFF level		K0	Set the lower limit to turn OFF the output flag at the time of using the upper/lower limit comparison function. Setting range: -31,250 to +31,250 (specified with a signed integer)
Upper/Lower limit comparison Lower limit comparison ON level		K0	Set the lower limit to turn ON the output flag at the time of using the upper/lower limit comparison function. Setting range: -31,250 to +31,250 (specified with a signed integer)

(Note) Make the following level settings for upper/lower limit comparison.
Lower limit comparison ON level ≤ Lower limit comparison OFF level < Upper limit comparison OFF level ≤ Upper limit comparison ON level

■ **Sample Program**

The digital conversion value on ch0 of the analog input unit is read to detect the upper limit and lower limit, and the desired output is turned ON with the upper or lower limit detected.

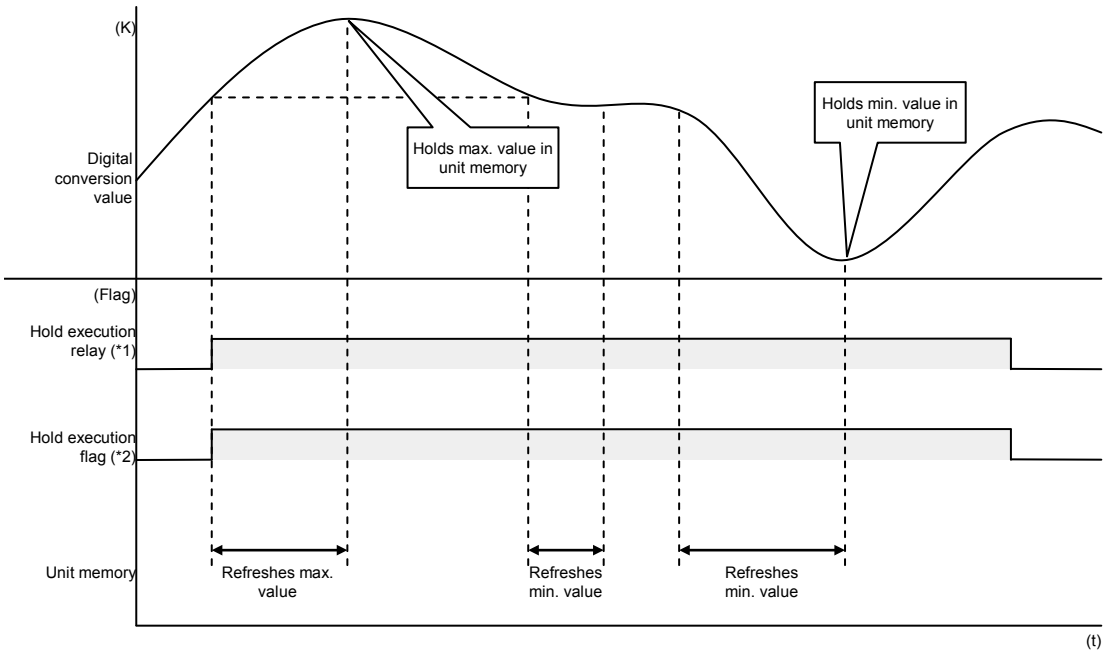


6.5 Holding Max./Min. Values

■ Overview of Functions

This function maintains the maximum and minimum values of acquired data. When the maximum and minimum value hold settings are valid, the maximum and minimum digital conversion values will be maintained and stored in the following unit memories.

- If the function has not been enabled with the configuration settings, the function will not work with the hold execution relay turned ON.
- When the hold execution relay is turned ON, the values at that time will be preset as maximum and minimum values in the unit memories.
- The maximum and minimum values will be stored in the unit memories even if the hold execution relay is turned OFF or the unit is set into PROG. mode.
- The maximum and minimum values are held on a channel-by-channel basis.



■ **Hold data storage area**

Unit memory number (Hex)	Name	Default	Setting range and description
UM 00180 UM 00181 UM 00182 UM 00183 UM 00184 UM 00185 UM 00186 UM 00187	Holding max. value	K0	The acquired maximum value will be held when the maximum and minimum value holding function is used. Setting range: -31,250 to 31,250 (specified with a signed integer)
UM 00188 UM 00189 UM 0018A UM 0018B UM 0018C UM 0018D UM 0018E UM 0018F	Holding min. value	K0	The acquired minimum value will be held when the maximum and minimum value holding function is used. Setting range: -31,250 to 31,250 (specified with a signed integer)

(Note) The unit memory numbers in the above table are listed for CH0 to CH7 in numerical order.

■ **I/O allocation**

The I/O numbers in the timing chart and program are shown on the condition that the first word number of the unit is 10. Actual I/O numbers allocated to the analog input unit are determined by the first word number.

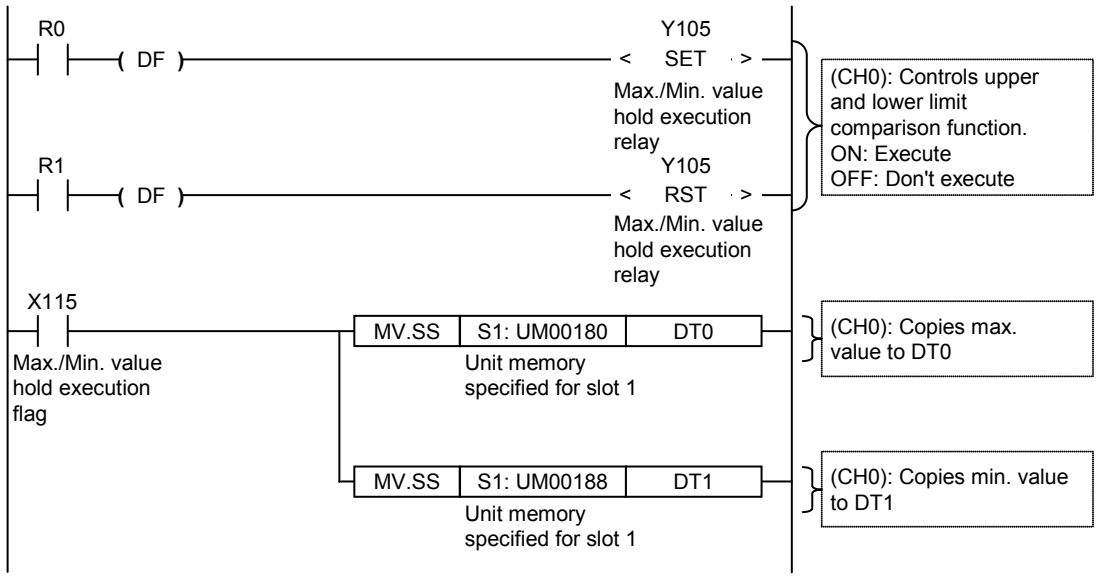
	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7
*1 Hold execution relay	Y105	Y115	Y125	Y135	Y145	Y155	Y165	Y175
*2 Hold execution flag	X115	X135	X155	X175	X195	X215	X235	X255

■ **Configuration**

Name		Default	Setting range and description
Function setting	Holding max./min. values	Not execute	Select “Execute.”
Holding min. value		K0	Holding min. value (-31,250 to +31,250)
Holding max. value		K0	Holding max. value (-31,250 to +31,250)

■ **Sample Program**

The analog data on ch0 of the analog input unit is read, and the data holding the maximum and minimum values will be read at the desired data register.



6.6 Disconnection detection

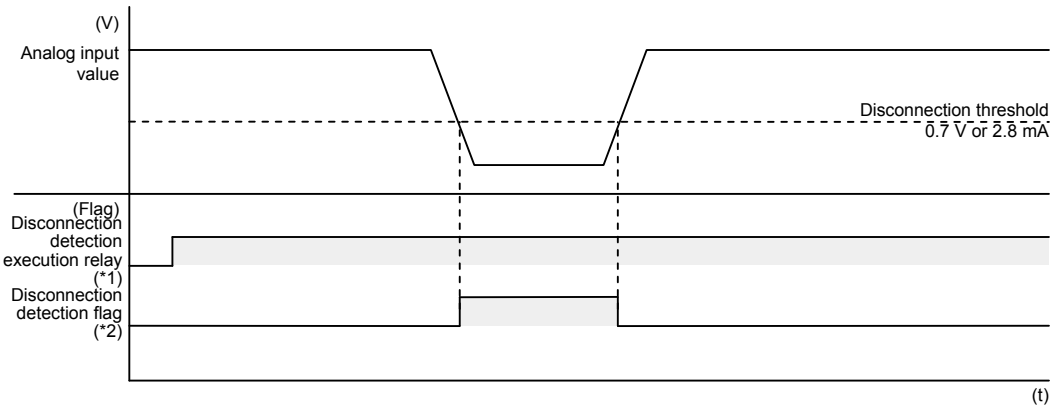
■ **Overview of Functions**

This function is to announce an error with the disconnection detection flag if the input is below a certain value in either range, +1 to +5V of voltage input or +4 to +20 mA of current input.

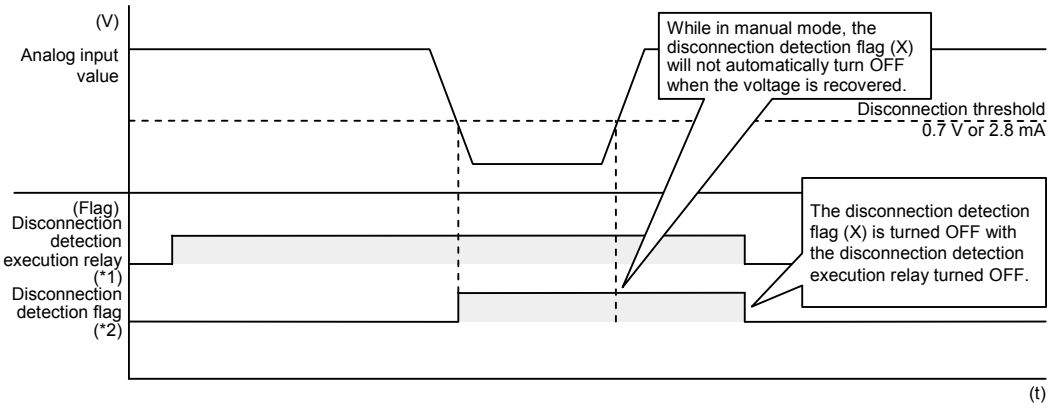
Voltage input range of +1 to +5 V set: 0.7 V or less; Current input range of +4 to +20 mA set: 2.8 mA max.

- If the input exceeds the above value while the disconnection detection execution relay is turned ON, the disconnection detection flag will be turned OFF automatically, provided that the auto setting has been made.
- If the manual reset setting is made, the disconnection detection flag will be turned OFF by using a user program and turning OFF the disconnection detection execution relay.
- If the configuration-disconnection detection setting has not been made, the function will be disabled with the disconnection detection execution relay turned ON.

■ **Action with the detection disconnection reset setting set to auto**



■ **Action with the detection disconnection reset setting set to manual**


(V)
Analog input value
While in manual mode, the disconnection detection flag (X) will not automatically turn OFF when the voltage is recovered.
Disconnection threshold
0.7 V or 2.8 mA
(Flag)
Disconnection detection execution relay (*1)
Disconnection detection flag (*2)
The disconnection detection flag (X) is turned OFF with the disconnection detection execution relay turned OFF.
(t)

■ I/O allocation

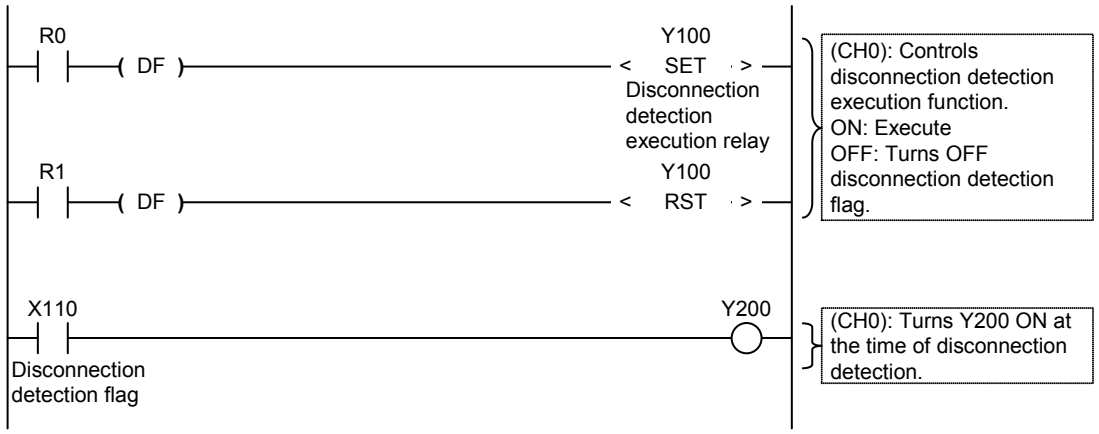
The I/O numbers in the timing chart and program are shown on the condition that the first word number of the unit is 10. Actual I/O numbers allocated to the analog input unit are determined by the first word number.

	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7
*1 Disconnection detection execution relay	Y100	Y110	Y120	Y130	Y140	Y150	Y160	Y170
*2 Disconnection detection flag	X110	X130	X150	X170	X190	X210	X230	X250

■ Configuration

Name		Default	Setting range and description
Function setting	Disconnection detection	Not execute	Select “Execute.”
	Disconnection detection reset	Auto	Select “Auto.”

■ Sample Program



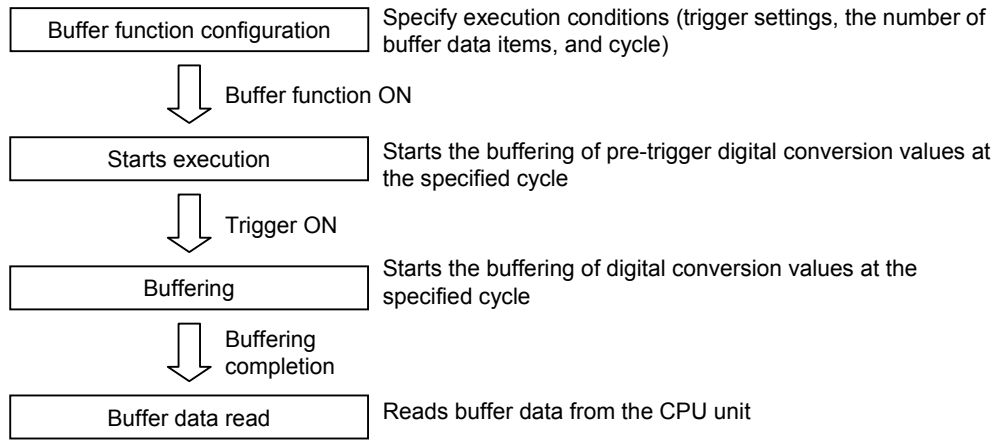
◆ NOTE

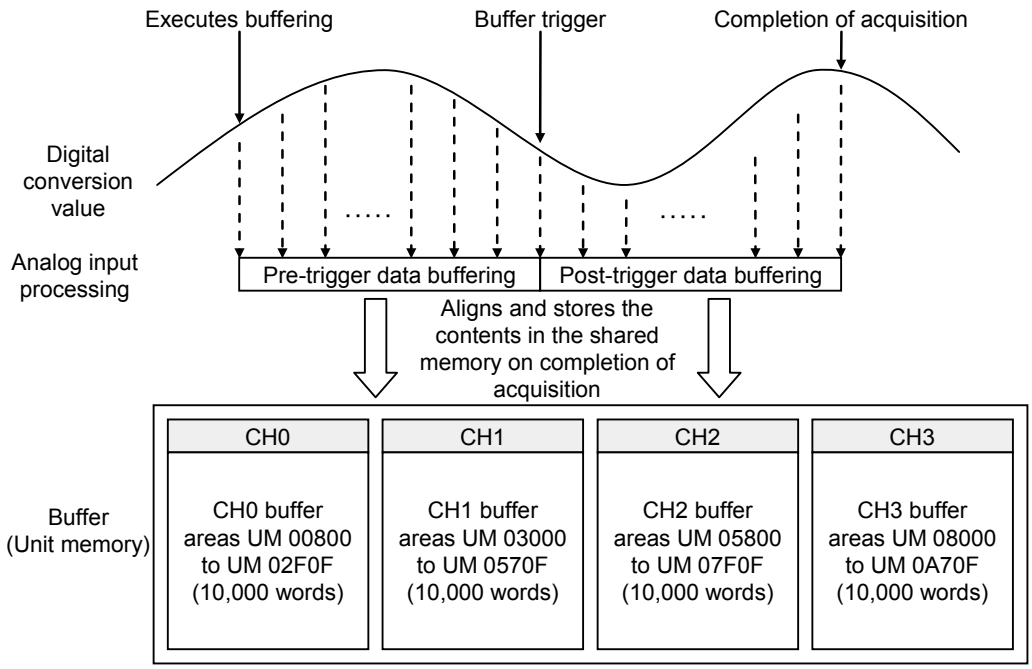
Not executed unless a voltage input range of +1 to +5 V or current input range of +4 to +20 mA is set.

6.7 Buffer Settings

6.7.1 Overview of Buffer Function

This function stores digital conversion values acquired at a preset cycle into a unit memory. If a trigger is input while the buffer function is executed (with the buffer execution relay turned ON), digital conversion values for a specified number of data items will be stored in the buffer memory (unit memory) at a specified cycle.


Buffer function configuration
Specify execution conditions (trigger settings, the number of buffer data items, and cycle)
Buffer function ON
Starts execution
Starts the buffering of pre-trigger digital conversion values at the specified cycle
Trigger ON
Buffering
Starts the buffering of digital conversion values at the specified cycle
Buffering completion
Buffer data read
Reads buffer data from the CPU unit


Executes buffering
Buffer trigger
Completion of acquisition
Digital conversion value
Analog input processing
Pre-trigger data buffering
Post-trigger data buffering
Aligns and stores the contents in the shared memory on completion of acquisition
Buffer (Unit memory)
CH0
CH1
CH2
CH3
CH0 buffer areas UM 00800 to UM 02F0F (10,000 words)
CH1 buffer areas UM 03000 to UM 0570F (10,000 words)
CH2 buffer areas UM 05800 to UM 07F0F (10,000 words)
CH3 buffer areas UM 08000 to UM 0A70F (10,000 words)

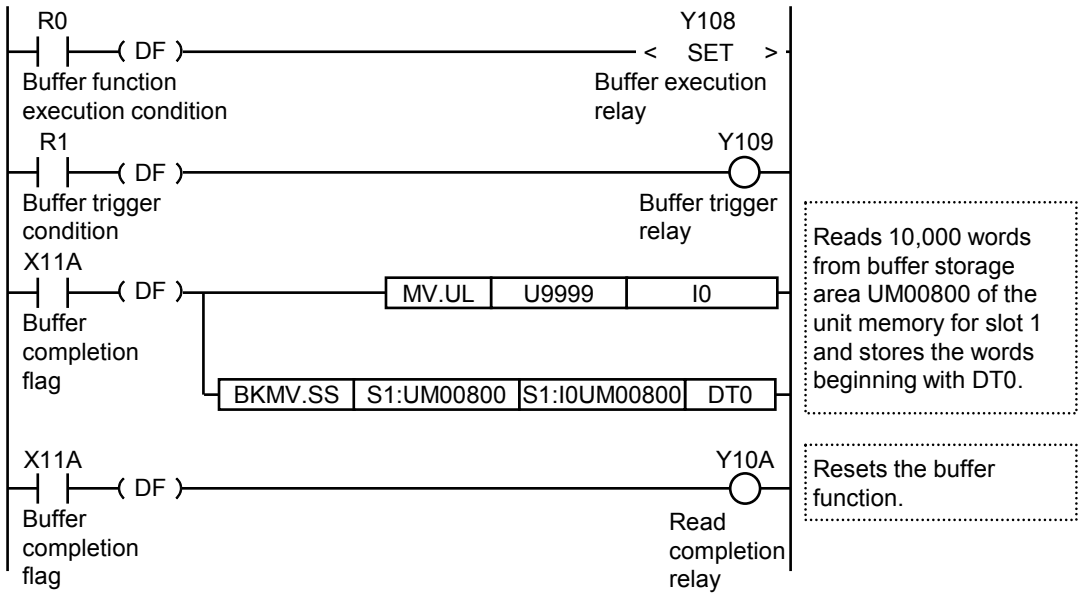
- If the configuration-disconnection detection setting has not been set to “not execute”, the function will be disabled even if the buffer execution relay is turned ON.

■ **Configuration**

Name	Default	Setting range and description
Buffer function Execution/Non-execution settings	Not use	Select "Use" for the buffer function.
Trigger setting	H0	Select a trigger signal to start buffering when the buffer function is used.
No. of buffer data items	K1000	Set the number of data items (words) to be stored in the buffer. Setting range: +1 to +10,000 (AFP7AD4H), +1 to +8,000 (AFP7AD8) * The number of buffer data items is the total sum of data items including the number of data items before triggering
No. of data items before triggering	K0	Set the number of data items (words) before triggering. Setting range: +1 to +9,999 (AFP7AD4H), +1 to +7,999 (AFP7AD8) * Set the number of data items before triggering to a value smaller than the number of buffer data items.
Trigger cycle	K1	Set the cycle enabling trigger input. The trigger period is obtained from the following formula. For AFP7AD8, only the non-isolated setting is available. At the time of isolation: Set value (1 to 3000) x Enabled number of channels x 5 [ms] At the time of non-isolation: Set value (1 to 3000) x Enabled number of channels x 0.025 [ms]
Input level trigger	K0	If “Input level” is selected for the trigger type, set an input level to enable triggering. Setting range: -31,250 to +31,250

■ **Sample program**

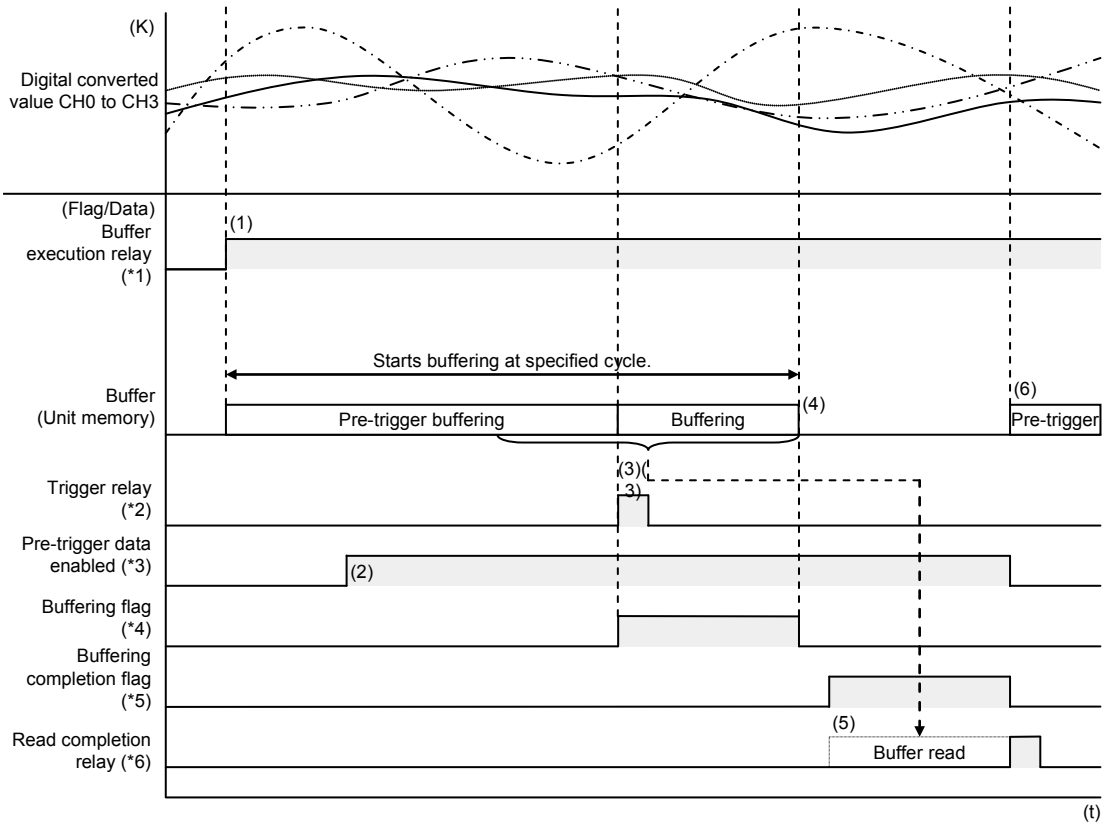
Select the trigger input relay for the trigger setting, set the trigger cycle to 1, the number of data items before triggering to 1,000, and the number of buffer data items to 10,000. After completion of buffering, acquire analog data in the desired data area.



6.7.2 Buffering by Trigger Output Relay

■ **Buffering by trigger output relay (YXXX)**

The following sequence shows the operation of starting buffer processing with the trigger relay (YXXX) turned ON by a user program.



(1) Pre-trigger buffering will start when the user program turns ON the buffer execution relay.

(2) The pre-trigger data enabled flag is turned ON when the number of pre-trigger data items is reached.

(3) Buffering starts with the trigger relay turned ON. The user program turns ON the trigger relay. Buffering will continue until the set number of buffer data items is reached after the trigger relay is turned ON.

(4) Buffering is completed with the number of buffer data items obtained.

(5) The user program reads the buffering data and turns ON the read completion relay.

(6) The unit waits for the next trigger and repeat the sequence from pre-trigger buffering.

■ I/O Allocation

The I/O numbers in the timing chart and program are shown on the condition that the first word number of the unit is 10. Actual I/O numbers allocated to the analog input unit are determined by the first word number. The buffer function is allocated to I/O on CH0. CH1 to CH7 all operate simultaneously with the I/O on CH0.

	CH0 to CH7
*1 Buffer execution relay	Y108
*2 Trigger relay	Y109
*3 Pre-trigger data enabled	X11B
*4 Buffering flag	X119
*5 Buffering completion flag	X11A
*6 Read completion relay	Y10A

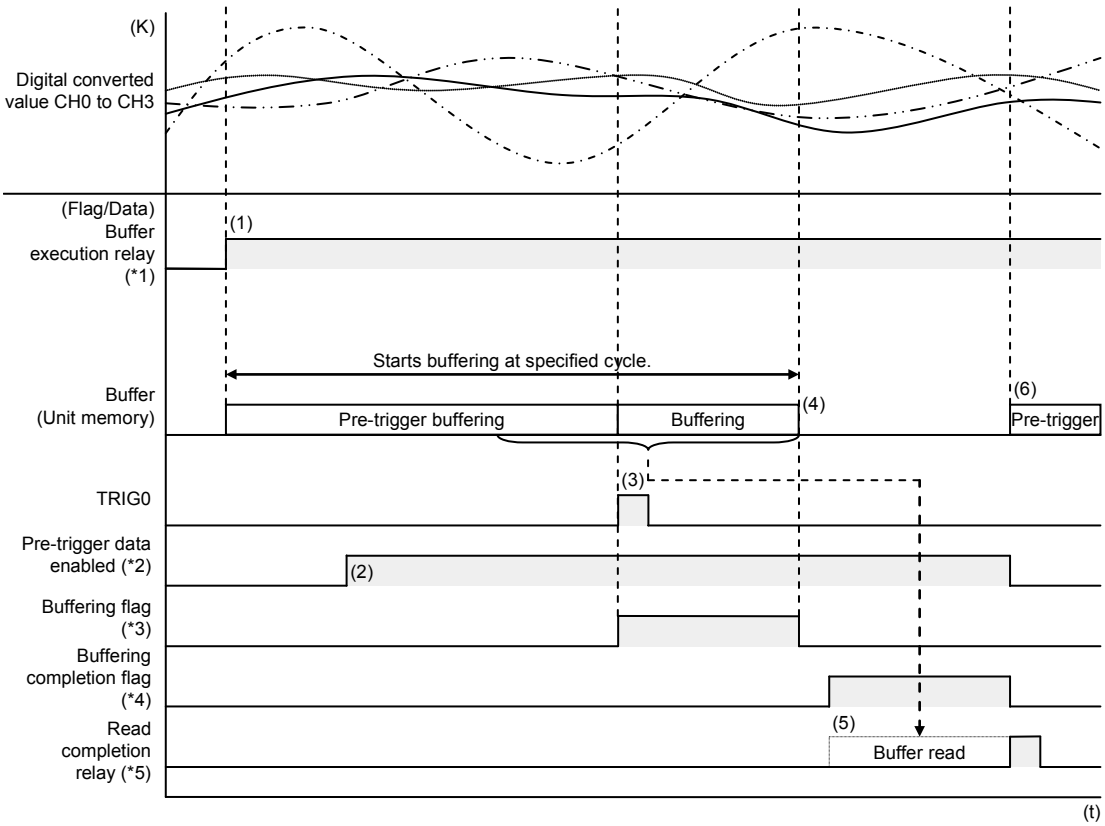
◆ NOTES

- **Trigger input will be prohibited with the buffer execution relay turned ON after trigger input. Input, if any, will be ignored.**
- **It is possible to start buffering with the trigger input even if the number of pre-trigger data items has not reached a specified number. (The area where pre-trigger data is not acquired is 0).**

6.7.3 Buffering by External Input Trigger

■ **Using external input as trigger**

The following sequence shows the operation of buffer processing with input into the external trigger input terminal of the unit.



(1) Pre-trigger buffering will start when the user program turns ON the buffer execution relay.

(2) The pre-trigger data enabled flag is turned ON when the number of pre-trigger data items is reached.

(3) Starts buffering with the rising of TRIG0. Buffering will continue until the preset number of buffer data items is reached from the rising of TRIG0.

(4) Buffering is completed with the number of buffer data items obtained.

(5) The user program reads the buffering data and turns ON the read completion relay.

(6) The unit waits for the next trigger and repeat the sequence from pre-trigger buffering.

■ I/O Allocation

The I/O numbers in the timing chart and program are shown on the condition that the first word number of the unit is 10. Actual I/O numbers allocated to the analog input unit are determined by the first word number. The buffer function is allocated to I/O on CH0. CH1 to CH7 all operate simultaneously with the I/O on CH0.

	CH0 to CH3
*1 Buffer execution relay	Y108
*2 Pre-trigger data enabled	X11B
*3 Buffering flag	X119
*4 Buffering completion flag	X11A
*5 Read completion relay	Y10A

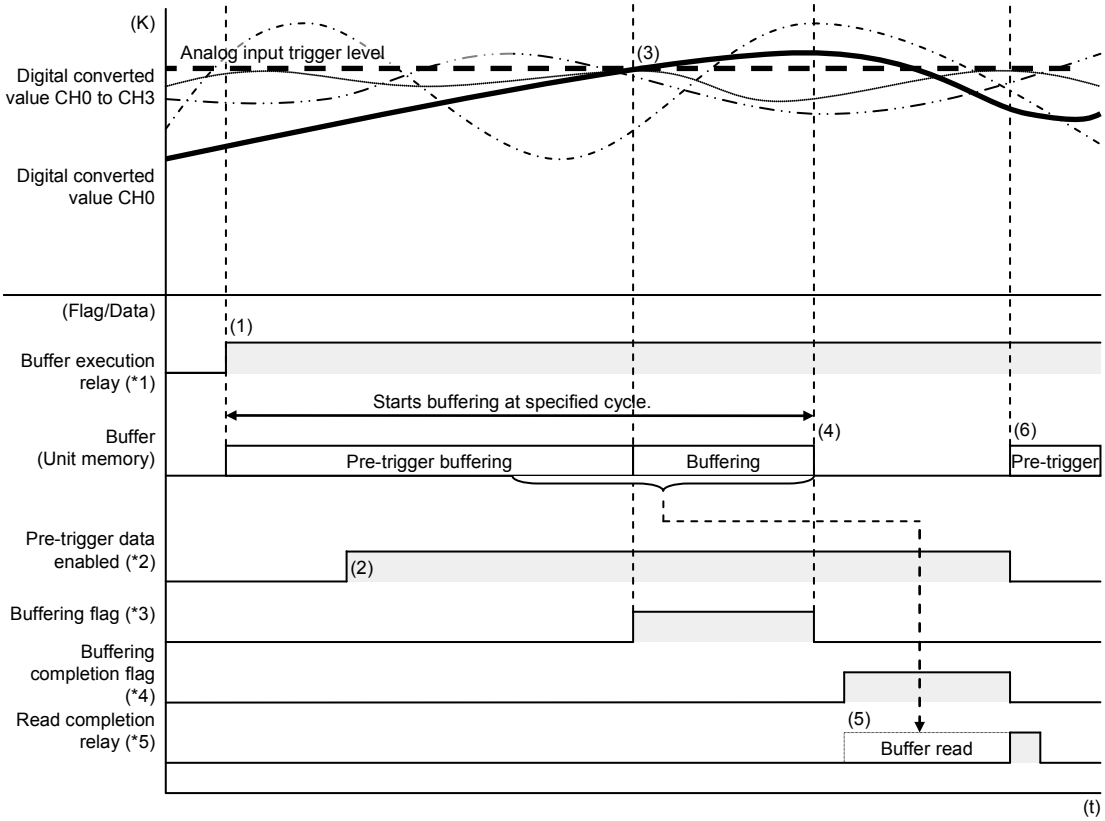
◆ NOTES

- **Trigger input will be prohibited with the buffer execution relay turned ON after trigger input. Input, if any, will be ignored.**
- **It is possible to start buffering with the trigger input even if the number of pre-trigger data items has not reached a specified number. (The area where pre-trigger data is not acquired is 0).**
- **TRIG0 to TRIG3 for external input trigger selection show input terminal numbers. Keep in mind that none of them supports CH0 to CH3.**
- **The buffer function will not be executed if "Not use" is selected with the external input trigger even if "External input trigger" is selected as "Trigger type" in the configuration menu of the FPWIN GR7.**

6.7.4 Buffering Triggered by Value Change in Analog Input

■ **Buffering by change in trigger input**

The following sequence shows the operation of starting buffer processing with the detection of a rise or fall of the digital converted value on a specified analog input channel. The example below shows a case where the level of analog input CH0 rises.



(1) Pre-trigger buffering will start when the user program turns ON the buffer execution relay.

(2) The pre-trigger data enabled flag is turned ON when the number of pre-trigger data items is reached.

(3) Buffering will start because the preset digital conversion value on CH0 has risen above the trigger level. Buffering will continue until the set number of buffer data items is reached after the rise of the trigger level.

(4) Buffering is completed with the number of buffer data items obtained.

(5) The user program reads the buffering data and turns ON the read completion relay.

(6) The unit waits for the next trigger and repeat the sequence from pre-trigger buffering.

■ I/O allocation

The I/O numbers in the timing chart and program are shown on the condition that the first word number of the unit is 10. Actual I/O numbers allocated to the analog input unit are determined by the first word number. The buffer function is allocated to I/O on CH0. CH1 to CH7 all operate simultaneously with the I/O on CH0.

	CH0 to CH7
*1 Buffer execution relay	Y108
*2 Pre-trigger data enabled	X11B
*3 Buffering flag	X119
*4 Buffering completion flag	X11A
*5 Read completion relay	Y10A

◆ NOTES

- **Trigger input will be prohibited with the buffer execution relay turned ON after trigger input. Input, if any, will be ignored.**
- **If analog input is selected, buffering will start at the rise (or fall) timing of the digital conversion value on the corresponding channel from a specified value. If the value exceeds a threshold value from the beginning, buffering will start at the moment the value exceeds the threshold value again after the value once falls below (or rises above) the set value.**
- **Keep in mind that the analog input trigger will generate timing that disables trigger detection depending on the buffer cycle setting.**
- **It is possible to start buffering with the trigger input even if the number of pre-trigger data items has not reached a specified number. (The area where pre-trigger data is not acquired is 0).**
- **The buffer function will not be executed if "Not use" is selected for the selection of an external input trigger or the selection of input level trigger channel.**
- **The buffer function will not be executed if "Not use" is selected for the input trigger channel even if "Analog input level" is selected as "Trigger type" in the configuration menu of the FPWIN GR7.**

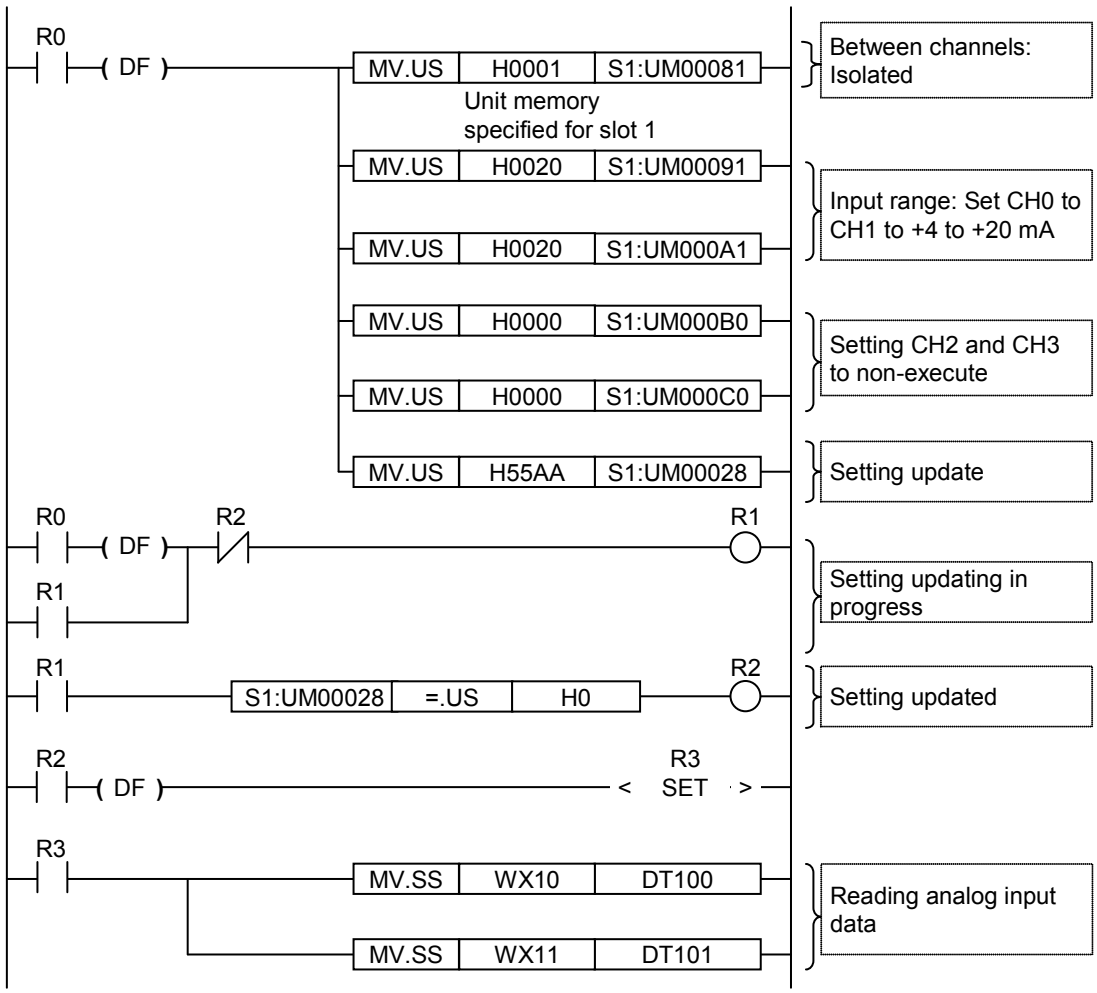
6.8 Configuration by Programming

■ **Overview of functions**

- The FP7 analog input unit makes it possible to overwrite configuration information by programming.
- The configuration information is refreshed by writing “55AA” to unit memory UM 00028 after the value is stored in the unit memory where a desired parameter is set.
- The value of unit memory UM 00028 will be set to 0 when the configuration information is refreshed.

■ **Sample program**

Between channels: Isolated; Input range: 4 to 20 mA with CH0 and CH1 set as execution channels and CH2 and CH3 set as non-execution channels.



7

What to Do If an Error Occurs

7.1 What to Do If an Error Occurs (Analog Input)

7.1.1 Failure in Reading Analog Input Data

- Check again that I/O allocations are correct.
- Check again the connections of the terminal block.
- Check again the configuration settings.

7.1.2 Unstable Analog Input Conversion Value

- Used a twisted pair shield wire and check that the wire is properly shielded.
- Check that the analog input wiring is not placed close to AC lines or high-tension lines or bundled with the lines.
- Check that there are no power lines, high-tension lines, high-capacity relays, or noise-generating equipment, such as inverters, close to the analog input unit.
- Check that the voltage or current for the range setting is set correctly.

7.1.3 No Proper Conversion Values Obtained with Current Input

- Check again the connections of the terminal block.
- Check again the connections of the output equipment.
- Check that the range setting is the current mode.

8

Specifications

8.1 Specifications

8.1.1 General Specifications

Items	Description	
Operating ambient temperature	0°C to 55°C	
Storage ambient temperature	-40°C to 70°C	
Operating ambient humidity	10% to 95% (RH) with no condensation (at 25°C)	
Storage ambient humidity	10% to 95% (RH) with no condensation (at 25°C)	
Breakdown voltage (Note)	Between I/O terminals and power supply terminals of CPU unit/function earth	500 V AC for 1 minute
	Between analog input terminal channels	200 V AC for 1 minute
Insulation resistance	Between I/O terminals and power supply terminals of CPU unit/function earth	100 MΩ (Test voltage: 500 V DC)
Vibration resistance	Conforming to JIS B 3502 and IEC 61131-2 5 to 8.4 Hz, 3.5-mm-wide single amplitude 8.4 to 150 Hz, acceleration 9.8 m/s^2 10-time sweeping in X, Y, and Z directions (1 octave/min.)	
Shock resistance	Conforming to JIS B 3502 and IEC 61131-2 147 m/s^2 or more., 3 times each in X, Y, and Z directions	
Noise resistance	1,000 V DC (p-p) with pulse width of 50 ns/1 μs (by using a noise simulator) (Applied to the power supply of the CPU unit)	
Environment	Free from corrosive gases and excessive dust.	
EU Directive applicable standard	EMC Directive: EN61131-2	
Overvoltage category	Category II or lower	
Pollution degree	Pollution degree 2 or lower	

(Note) Cutoff current: 5 mA (Factory default setting)

8.1.2 Performance Specifications (AFP7AD4H)

Items		Description
No. of input points		4 channels
Input range (resolution)	Voltage	-10 to +10 V DC (Resolution: 1/62,500) 0 to +10 V DC (Resolution: 1/31,250) 0 to +5 V DC (Resolution: 1/31,250) +1 to +5 V DC (Resolution: 1/25,000) (see note 3)
	Current	0 to +20 mA (Resolution: 1/31,250) +4 to +20 mA (Resolution: 1/25,000) (see note 3)
Conversion speed		25 µs/Ch (non-isolation); 5 ms/Ch (isolation)
Total accuracy		±0.05% F.S. max. (at +25°C) and ±0.1% F.S. max. (at 0°C to +55°C)
Input impedance		Voltage input: Approximately 1MΩ; current input: Approximately 250Ω
Absolute max. input		Voltage input: -15 to +15 V; current input: -30 to +30 mA
Insulation system		Between input terminals and internal circuit: Photocoupler and isolated DC/DC converter Between channels: Photo-MOS relay
Execution/Non-execution channel settings		Possible to make non-converted channel settings.
Input range selection		Possible to make settings on a channel-by-channel basis
Average processing settings	Number of averaging times	Setting range of 2 to 60,000 times
	Time average	Time setting range of 1 to 1,500 ms (non-isolated) and 200 to 60,000 ms (isolated)
	Moving average	Setting range of 2 to 2,000 times
Offset/Gain processing		A desired value within the digital output range can be set for the offset value. Setting range: -3,000 to +3,000 A desired value within the digital output range can be set for the offset value. Setting range: 9,000 to +11,000 (90% to 110%)
Scale conversion settings		A desired value within the digital input range can be set for the offset value. Setting range: -30,000 to +30,000
Comparison settings for upper and lower limits		Output if the value is outside the preset upper and lower limits
Holding max./min. values		Holding max./min. values sampled
Disconnection detection		Disconnection detection is possible at the time of setting ranges of +1 to +5 V and +4 to +20 mA Possible to select auto or manual resetting.
Buffer function		The buffering of up to 10,000 words is possible on each channel. Sampling is performed with a change in desired input, external input, or analog input as a trigger.

(Note 1) Set any of the following functions in the configuration menu of the tool software or a user program: Input range, selection of isolation and non-isolation, conversion execution/non-execution channel, averaging processing, offset/gain, scaling processing, upper/lower limit comparison, holding max./min. value, disconnection detection, and buffer.

(Note 2) If not all channels are used, the conversion speed can be saved by setting non-execution channels with the function of setting the conversion execution/non-execution channels used.

(Note 3) The full scale (F.S.) on the accuracy of an analog voltage input range from +1 to +5 V and that of an analog current input range from +4 to +20 mA are 0 to +5 V and 0 to +20 mA, respectively.

8.1.3 Performance Specifications (AFP7AD8)

Items		Description
No. of input points		8 channels
Input range (resolution)	Voltage	-10 to +10 V DC (Resolution: 1/62,500) 0 to +10 V DC (Resolution: 1/31,250) 0 to +5 V DC (Resolution: 1/31,250) +1 to +5 V DC (Resolution: 1/25,000) (see note 3)
	Current	0 to +20 mA (Resolution: 1/31,250) +4 to +20 mA (Resolution: 1/25,000) (see note 3)
Conversion speed		25 µs/Ch
Total accuracy		±0.1% F.S. max. (at +25°C) and ±0.3% F.S. max. (at 0°C to +55°C)
Input impedance		Voltage input: Approximately 1MΩ; current input: Approximately 250Ω
Absolute max. input		Voltage input: -15 to +15 V; current input: -30 to +30 mA
Insulation system		Between input terminals and internal circuit: Photocoupler and isolated DC/DC converter Between channels: Photo-MOS relay
Execution/Non-execution channel settings		Possible to make non-converted channel settings.
Input range selection		Possible to make settings on a channel-by-channel basis
Average processing settings	Number of averaging times	Setting range of 2 to 60,000 times
	Time average	Time setting range of 1 to 1,500 ms
	Moving average	Setting range of 2 to 2,000 times
Offset/Gain processing		A desired value within the digital output range can be set for the offset value. Setting range: -3,000 to +3,000 A desired value within the digital output range can be set for the offset value. Setting range: 9,000 to +11,000 (90% to 110%)
Scale conversion settings		A desired value within the digital input range can be set for the offset value. Setting range: -30,000 to +30,000
Comparison settings for upper and lower limits		Output if the value is outside the preset upper and lower limits
Holding max./min. values		Holding max./min. values sampled
Disconnection detection		Disconnection detection is possible at the time of setting ranges of +1 to +5 V and +4 to +20 mA Possible to select auto or manual resetting.
Buffer function		The buffering of up to 8,000 words is possible on each channel. Sampling is performed with a change in desired input, external input, or analog input as a trigger.

(Note 1) Set any of the following functions in the configuration menu of the tool software or a user program: Input range, selection of isolation and non-isolation, conversion execution/non-execution channel, averaging processing, offset/gain, scaling processing, upper/lower limit comparison, holding max./min. value, disconnection detection, and buffer.

(Note 2) If not all channels are used, the conversion speed can be saved by setting non-execution channels with the function of setting the conversion execution/non-execution channels used.

(Note 3) The full scale (F.S.) on the accuracy of an analog voltage input range from +1 to +5 V and that of an analog current input range from +4 to +20 mA are 0 to +5 V and 0 to +20 mA, respectively.

8.2 I/O Allocation

■ Input contact

I/O area No.	Name	Default	Description
WX0	CH0 Analog conversion data	K0	Analgo conversion data area Digital converted values corresponding to the analog input is stored. <Voltage range> -10 to +10 V: -31,250 to +31,250 0 to +10 V or 0 to +5 V: 0 to +31,250 +1 to +5 V: 0 to +25,000 <Current range> 0 to +20 mA: 0 to +31,250 +4 to +20 mA: 0 to +25,000 Optional function flag area Refer to the table on the next page.
WX1	CH0 Optional function flag	H0	
WX2	CH1 Analog conversion data	K0	
WX3	CH1 Optional function flag	H0	
WX4	CH2 Analog conversion data	K0	
WX5	CH2 Optional function flag	H0	
WX6	CH3 Analog conversion data	K0	
WX7	CH3 Optional function flag	H0	
WX8	CH4 Analog conversion data	K0	
WX9	CH4 Optional function flag	H0	
WX10	CH5 Analog conversion data	K0	
WX11	CH5 Optional function flag	H0	
WX12	CH6 Analog conversion data	K0	
WX13	CH6 Optional function flag	H0	
WX14	CH7 Analog conversion data	K0	
WX15	CH7 Optional function flag	H0	

(Note 1): The I/O numbers in the table indicates offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit. Example) When the starting word number for the unit is "10", the A/D conversion data of CH0 is WX10 and the error flag is X11F.

(Note 2) It is A/D conversion data within the specified scale range when setting the scale conversion setting.

(Note 3) The digital converted value corresponding to about 2 V of analog input is displayed for channels which are not connected to input when setting the voltage range with AFP7AD8.

■ Input contact (Optional functions/Error flag area)

I/O No.								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
X10	X30	X50	X70	X90	X110	X130	X150	Disconnection detection flag	ON with disconnection detected and OFF with disconnection restored. (Valid for 1 to 5 V and 4 to 20 mA ranges only)
X11	X31	X51	X71	X91	X111	X131	X151	Upper limit comparison relay	Turns ON when the value exceeds the set upper limit.
X12	X32	X52	X72	X92	X112	X132	X152	Lower limit comparison relay	Turns OFF when the value drops below the set lower limit.
X13	X33	X53	X73	X93	X113	X133	X153	Upper/Lower limit comparison execution flag	Turns ON when the upper limit/lower limit comparison function is executed.
X14	X34	X54	X74	X94	X114	X134	X154	Not used	Do not use.
X15	X35	X55	X75	X95	X115	X135	X155	Max./Min. hold execution flag	Turns ON when the max./min. hold function is executed.
X16 to X17	X36 to X37	X56 to X57	X76 to X77	X96 to X97	X116 to X117	X136 to X137	X156 to X157	Not used	Do not use.
X18	-	-	-	-	-	-	-	Buffer function execution flag	On when the buffer function is executed.
X19	-	-	-	-	-	-	-	Buffering flag	ON when buffering starts after the trigger is accepted. OFF when the number of buffer data items is reached.
X1A	-	-	-	-	-	-	-	Buffering completion flag	ON when the shared memory has become accessible after completion of buffering. OFF on completion of buffer data reading.
X1B	-	-	-	-	-	-	-	Data before triggering enable flag	ON when the number of buffer data items before triggering has reached the set value. OFF on completion of buffer data reading.
X1C to X1E	X3C to X3E	X5C to X5E	X7C to X7E	X9C to X9E	X11C to X11E	X13C to X13E	X15C to X15E	Not used	Do not use.
X1F	X3F	X5F	X7F	X9F	X11F	X13F	X15F	Error flag	Turns ON when an error occurs

(Note 1): The I/O numbers in the table indicates offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit. Example) When the starting word number for the unit is "10", the error flag is X11F.

(Note 2) The conditions of the buffer function (i.e., the buffer function execution flag, buffering flag, buffering completion flag, and data enable flag before triggering) are allocated to the input contacts for CH0.

■ **Output contact (Optional functions/Error flag area)**

I/O No.								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
Y0	Y10	Y20	Y30	Y40	Y50	Y60	Y70	Disconnection detection execution relay	ON to execute the disconnection detection function. OFF to turn OFF the disconnection detection flag (Xn0). (Valid for 1 to 5 V and 4 to 20 mA ranges only)
Y1	Y11	Y21	Y31	Y41	Y51	Y61	Y71	Not used	Do not use.
Y2	Y12	Y22	Y32	Y42	Y52	Y62	Y72		
Y3	Y13	Y23	Y33	Y43	Y53	Y63	Y73	Upper/Lower limit comparison execution relay	ON to execute the function to compare the upper and lower limits. OFF to turn OFF the upper limit comparison relay (Xn1) and lower limit comparison relay (Xn2).
Y4	Y14	Y24	Y34	Y44	Y54	Y64	Y74	Not used	Do not use.
Y5	Y15	Y25	Y35	Y45	Y55	Y65	Y75	Max./Min. hold execution relay	ON to execute the max./min. hold function.
Y6	Y16	Y26	Y36	Y46	Y56	Y66	Y76	Not used	Do not use.
Y7	Y17	Y27	Y37	Y47	Y57	Y67	Y77	Not used	Do not use.
Y8	-	-	-	-	-	-	-	Buffer execution relay	When the buffer function is enabled, trigger acceptance will be permitted with the buffer execution relay turned ON.The internal state transition will be initialized with the buffer execution relay turned OFF.
Y9	-	-	-	-	-	-	-	Buffer trigger relay	If "Trigger relay" is set in trigger setting, triggering will start with the trigger relay turned ON.
YA	-	-	-	-	-	-	-	Buffer data read completion relay	ON for one scan upon completion of readign buffer data from the shared memory with a user program. Goes to the state of trigger acceptance permitted after clearing the buffer memory.
YB to YE	Y1B to Y1E	Y2B to Y2E	Y3B to Y3E	Y4B to Y4E	Y5B to Y5E	Y6B to Y6E	Y7B to Y7E	Not used	Do not use.
YF	Y1F	Y2F	Y3F	Y4F	Y5F	Y6F	Y7F	Error flag reset relay	Resets an error flag.

(Note 1): The I/O numbers in the table indicates offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit. Example) When the starting word number for the unit is "10", the disconnection detection execution relay of CH0 is Y100, and the error flag reset relay is Y10F.

(Note 2) The operation of the buvver function (consisting of the buffer execution relay, buffer trigger relay, and buffer data read completion relay) is specified by the output contacts for CH0.

8.3 List of Unit Memories

8.3.1 List of Unit Memory Number

There is no need to set unit memory values, because unit memory values will be written automatically if they are set in the configuration menu of the FPWIN GR7 tool software. In the case of making program settings, specify the desired unit memory numbers and write the corresponding values.

■ **Setting monitoring items and allocation of unit memory numbers (CH0 to CH3)**

Setting monitoring item		Unit memory no.			
		CH0	CH1	CH2	CH3
Unit memory update		UM 00028			
Isolation between channels		UM 00081 (AFP7AD4H only)			
Buffer function	Execution/Non-execution settings	UM 00088			
	Trigger type	UM 00089			
	No. of buffer data items	UM 0008A			
	No. of data items before triggering	UM 0008B			
	Trigger cycle	UM 0008C			
	Analog input trigger level	UM 0008D			
Conversion processing		UM 00090	UM 000A0	UM 000B0	UM 000C0
Range setting		UM 00091	UM 000A1	UM 000B1	UM 000C1
Function setting 1	Average processing settings Offset/Gain processing Scale conversion	UM 00092	UM 000A2	UM 000B2	UM 000C2
Function setting 2	Comparison of upper and lower limits Holding max./min. values Disconnection detection Disconnection detection reset	UM 00093	UM 000A3	UM 000B3	UM 000C3
Averaging constant		UM 00094	UM 000A4	UM 000B4	UM 000C4
Offset value		UM 00095	UM 000A5	UM 000B5	UM 000C5
Gain value		UM 00096	UM 000A6	UM 000B6	UM 000C6
Scale conversion	Max. value	UM 00097	UM 000A7	UM 000B7	UM 000C7
	Min. Value	UM 00098	UM 000A8	UM 000B8	UM 000C8
Upper limit / Lower limit comparison	Upper limit comparison ON level	UM 00099	UM 000A9	UM 000B9	UM 000C9
	Upper limit comparison OFF level	UM 0009A	UM 000AA	UM 000BA	UM 000CA
	Lower limit comparison OFF level	UM 0009B	UM 000AB	UM 000BB	UM 000CB
	Lower limit comparison ON level	UM 0009C	UM 000AC	UM 000BC	UM 000CC
Max./Min. value hold monitor area	Holding max. value	UM 00180	UM 00181	UM 00182	UM 00183
	Holding min. value	UM 00188	UM 00189	UM 0018A	UM 0018B
Buffer function	Hold data storage area	UM 00800 to UM 02F0F	UM 03000 to UM 0570F	UM 05800 to UM 07F0F	UM 08000 to UM 0A70F

■ **Setting monitoring items and allocation of unit memory numbers (CH4 to CH7)**

Setting monitoring item		Unit memory no.			
		CH4	CH5	CH6	CH7
Unit memory update		UM 00028			
Isolation between channels		UM 00081			
Buffer function	Execution/Non-execution settings	UM 00088			
	Trigger type	UM 00089			
	No. of buffer data items	UM 0008A			
	No. of data items before triggering	UM 0008B			
	Trigger cycle	UM 0008C			
	Analog input trigger level	UM 0008D			
Conversion processing		UM 000D0	UM 000E0	UM 000F0	UM 00100
Range setting		UM 000D1	UM 000E1	UM 000F1	UM 00101
Function setting 1	Average processing settings Offset/Gain processing Scale conversion	UM 000D2	UM 000E2	UM 000F2	UM 00102
Function setting 2	Comparison of upper and lower limits Holding max./min. values Disconnection detection Disconnection detection reset	UM 000D3	UM 000E3	UM 000F3	UM 00103
Averaging constant		UM 000D4	UM 000E4	UM 000F4	UM 00104
Offset value		UM 000D5	UM 000E5	UM 000F5	UM 00105
Gain value		UM 000D6	UM 000E6	UM 000F6	UM 00106
Scale conversion	Max. value	UM 000D7	UM 000E7	UM 000F7	UM 00107
	Min. Value	UM 000D8	UM 000E8	UM 000F8	UM 00108
Upper limit / Lower limit comparison	Upper limit comparison ON level	UM 000D9	UM 000E9	UM 000F9	UM 00109
	Upper limit comparison OFF level	UM 000DA	UM 000EA	UM 000FA	UM 0010A
	Lower limit comparison OFF level	UM 000DB	UM 000EB	UM 000FB	UM 0010B
	Lower limit comparison ON level	UM 000DC	UM 000EC	UM 000FC	UM 0010C
Max./Min. value hold monitor area	Holding max. value	UM 00184	UM 00185	UM 00186	UM 00187
	Holding min. value	UM 0018C	UM 0018D	UM 0018E	UM 0018F
Buffer function	Hold data storage area	UM 08100 to UM 0A03F	UM 0A040 to UM 0BF7F	UM 0BF80 to UM 0DEBF	UM 0DEC0 to UM 0FDFF

8.4 List of Detailed Specifications of Unit Memories

■ Common to All Channels

<table>
<tr><th>Unit memory number (Hex)</th><th>Name</th><th>Default</th><th>Setting range and description</th></tr>
<tr><td>UM 00028</td><td>Unit memory update</td><td>H0</td><td>This is used to rewrite configuration infromation using a user program. If the constant "55AA" is written to the unit memory UM 00028 after transferring a desired parameter to a unit memory, the settings will be updated. The value of unit memory UM 00028 will be set to 0 when the configuration information is refreshed.</td></tr>
<tr><td>UM 00081</td><td>Isolation between channels</td><td>H0</td><td>Select the insulation or non-insulation between analog input channels.
H0: Non-isolated
H1: Isolated</td></tr>
<tr><td>UM 00088</td><td>Buffer function Execution/Non-execution settings</td><td>H0</td><td>Select the use of the buffer function.
H0: Not use
H1: Use</td></tr>
<tr><td>UM 00089</td><td>Buffer function Trigger settings (AFP7AD4H)</td><td>H0</td><td>Select a trigger signal to start buffering when the buffer function is used.
<table>
<tr><th>Bit</th><th>Name</th><th>Description</th></tr>
<tr><td>3-0</td><td>Trigger type</td><td>H0 Trigger input relay
H1 Rise of external input trigger
H2 Fall of external input trigger input
H4 Rising time of analog input level
H8 Falling time of analog input level</td></tr>
<tr><td>7-4</td><td>External input trigger</td><td>H0 Unused
H1 TRG0
H2 TRG1
H4 TRG2
H8 TRG3</td></tr>
<tr><td>11-8</td><td>Input level trigger CH</td><td>H0 Unused
H1 CH0
H2 CH1
H4 CH2
H8 CH3</td></tr>
<tr><td>15-12</td><td>Not used</td><td></td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Unit memory number (Hex)</th><th>Name</th><th>Default</th><th>Setting range and description</th></tr>
<tr><td>UM 00089</td><td>Buffer function Trigger settings (AFP7AD8)</td><td>H0</td><td>Select a trigger signal to start buffering when the buffer function is used.
<table>
<tr><th>Bit</th><th>Name</th><th>Description</th></tr>
<tr><td>3-0</td><td>Trigger type</td><td>H0 Trigger input relay
H1 Rise of external input trigger
H2 Fall of external input trigger input
H4 Rising time of analog input level
H8 Falling time of analog input level</td></tr>
<tr><td>7-4</td><td>Note used</td><td></td></tr>
<tr><td>11-8</td><td>Input level trigger CH</td><td>H0 CH0
H1 CH1
H2 CH2
H3 CH3
H4 CH4
H5 CH5
H6 CH6
H7 CH7</td></tr>
<tr><td>15-12</td><td>Not used</td><td></td></tr>
</table></td></tr>
<tr><td>UM 0008A</td><td>Buffer function No. of buffer data items</td><td>K1,000</td><td>Set the number of data items (words) to be stored in the buffer.
Setting range: +1 to +10,000 (AFP7AD4H), +1 to +8,000 (AFP7AD8)</td></tr>
<tr><td>UM 0008B</td><td>Buffer function No. of pre-trigger data items</td><td>K0</td><td>Set the number of data items (words) out of the number of buffer data items before triggering.
Setting range: 0 to +9,999 (AFP7AD4H), 0 to +7,999 (AFP7AD8)</td></tr>
<tr><td>UM 0008C</td><td>Buffer function Trigger cycle</td><td>K1</td><td>Set the cycle enabling trigger input. The trigger cycle is obtained from the following formula. For AFP7AD8, only the non-isolated setting is available.
Isolated: Set value (1 to 30,000) × No. of enabled channels × 5 [ms]
Non-isolated: Set value (1 to 30,000) × No. of enabled channels × 0.025 [ms]</td></tr>
<tr><td>UM 0008D</td><td>Buffer function Analog input Trigger level</td><td>K0</td><td>If “Analog input level” is selected for the trigger type, set an input level to enable triggering.
Setting range: -31,250 to +31,250</td></tr>
</table>

■ Individual setting area per channel

<table>
<tr><th>Unit memory number (Hex)</th><th>Name</th><th>Default</th><th>Setting range and description</th></tr>
<tr><td>UM 00090
UM 000A0
UM 000B0
UM 000C0
UM 000D0
UM 000E0
UM 000F0
UM 00100</td><td>Conversion processing Execution/Non-execution</td><td>H1</td><td>Select the conversion function to be used.
H0: Not execute
H1: Execute</td></tr>
<tr><td>UM 00091
UM 000A1
UM 000B1
UM 000C1
UM 000D1
UM 000E1
UM 000F1
UM 00101</td><td>Range setting</td><td>H1</td><td>Select the input range.
H1: Voltage input -10 to +10 V
H2: Voltage input 0 to +10 V
H4: Voltage input 0 to +5 V
H8: Voltage input +1 to+ 5 V
H10: Current input 0 to +20 mA
H20: Current input +4 to +20 mA</td></tr>
<tr><td>UM 00092
UM 000A2
UM 000B2
UM 000C2
UM 000D2
UM 000E2
UM 000F2
UM 00102</td><td>Function setting 1
Average processing settings
Offset processing/ Gain processing
Scale conversion</td><td>H0</td><td>Select the desired function to be used.
<table>
<tr><th>Bit</th><th>Name</th><th>Settings</th></tr>
<tr><td>3-0</td><td>Average processing</td><td>H0 Not execute
H1 No. of averaging times
H2 Time average
H4 Moving average</td></tr>
<tr><td>7-4</td><td>Offset/Gain processing</td><td>H0 Not execute
H1 Execute</td></tr>
<tr><td>11-8</td><td>Scale conversion</td><td>H0 Not execute
H1 Execute</td></tr>
<tr><td>15-12</td><td>Not used</td><td></td></tr>
</table></td></tr>
<tr><td>UM 00093
UM 000A3
UM 000B3
UM 000C3
UM 000D3
UM 000E3
UM 000F3
UM 00103</td><td>Function setting 2
Comparison of upper and lower limits
Holding max./min. values
Disconnection detection
Disconnection detection reset</td><td>H0</td><td>Select the desired function to be used.
<table>
<tr><th>Bit</th><th>Name</th><th>Settings</th></tr>
<tr><td>3-0</td><td>Upper limit / Lower limit comparison</td><td>H0 Not execute
H1 Execute</td></tr>
<tr><td>7-4</td><td>Max./Min. values hold</td><td>H0 Not execute
H1 Execute</td></tr>
<tr><td>11-8</td><td>Disconnection detection</td><td>H0 Not execute
H1 Execute</td></tr>
<tr><td>15-12</td><td>Disconnection detection reset</td><td>H0 Auto (Auto reset for reconnection)
H1 Manual</td></tr>
</table></td></tr>
</table>

(Note) The unit memory numbers in the above table are listed for CH0 to CH7 in numerical order.

■ **Individual setting area per channel**

<table>
<tr><th>Unit memory number (Hex)</th><th>Name</th><th>Default</th><th>Setting range and description</th></tr>
<tr><td>UM 00094
UM 000A4
UM 000B4
UM 000C4
UM 000D4
UM 000E4
UM 000F4
UM 00104</td><td>Averaging constant</td><td>K200</td><td>Set constants for average processing.<table><tr><td>Function used</td><td colspan="2">Settings</td></tr><tr><td>Number of averaging times</td><td>No. of averaging times</td><td>2 to 60,000 [times]</td></tr><tr><td>Average time</td><td>Non-isolated
Isolated</td><td>1 to 1,500 [ms]
200 to 60,000 [ms]</td></tr><tr><td>Moving average</td><td>No. of moving average</td><td>2 to 2,000 [times]</td></tr></table></td></tr>
<tr><td>UM 00095
UM 000A5
UM 000B5
UM 000C5
UM 000D5
UM 000E5
UM 000F5
UM 00105</td><td>Offset value</td><td>K0</td><td>Set an offset value at the time of using the offset processing function.
Setting range: -3,000 to +3,000 (specified with a signed integer)</td></tr>
<tr><td>UM 00096
UM 000A6
UM 000B6
UM 000C6
UM 000D6
UM 000E6
UM 000F6
UM 00106</td><td>Gain value</td><td>K10,000</td><td>Set an offset value at the time of using the offset processing function.
Setting range: +9,000 to +11,000 (0.9x to 1.1x: Specified with a signed integer)</td></tr>
<tr><td>UM 00097
UM 000A7
UM 000B7
UM 000C7
UM 000D7
UM 000E7
UM 000F7
UM 00107</td><td>Scale conversion Max. value</td><td>K10,000</td><td>Set the maximum value at the time of using the scale conversion function.
Setting range: -30,000 to +30,000 (specified with a signed integer)</td></tr>
<tr><td>UM 00098
UM 000A8
UM 000B8
UM 000C8
UM 000D8
UM 000E8
UM 000F8
UM 00108</td><td>Scale conversion Min. value</td><td>K0</td><td>Set the minimum value at the time of using the scale conversion function.
Setting range: -30,000 to +30,000 (specified with a signed integer)</td></tr>
<tr><td>UM 00099
UM 000A9
UM 000B9
UM 000C9
UM 000D9
UM 000E9
UM 000F9
UM 00109</td><td>Upper limit comparison ON level</td><td>K0</td><td>Set the upper limit to turn ON the output flag at the time of using the upper/lower limit comparison function.
Setting range: -31,250 to +31,250 (specified with a signed integer)</td></tr>
</table>

Unit memory number (Hex)	Name	Default	Setting range and description
UM 0009A UM 000AA UM 000BA UM 000CA UM 000DA UM 000EA UM 000FA UM 0010A	Upper limit comparison OFF level	K0	Set the upper limit to turn OFF the output flag at the time of using the upper/lower limit comparison function. Setting range: -31,250 to +31,250 (specified with a signed integer)
UM 0009B UM 000AB UM 000BB UM 000CB UM 000DB UM 000EB UM 000FB UM 0010B	Lower limit comparison OFF level	K0	Set the lower limit to turn OFF the output flag at the time of using the upper/lower limit comparison function. Setting range: -31,250 to +31,250 (specified with a signed integer)
UM 0009C UM 000AC UM 000BC UM 000CC UM 000DC UM 000EC UM 000FC UM 0010C	Lower limit comparison ON level	K0	Set the lower limit to turn ON the output flag at the time of using the upper/lower limit comparison function. Setting range: -31,250 to +31,250 (specified with a signed integer)

(Note) The unit memory numbers in the above table are listed for CH0 to CH7 in numerical order.

■ **Individual monitor area per channel**

Unit memory number (Hex)	Name	Default	Setting range and description
UM 00180 UM 00181 UM 00182 UM 00183 UM 00184 UM 00185 UM 00186 UM 00187	Holding max. value	K0	The acquired maximum value will be held when the maximum and minimum value holding function is used. Setting range: -31,250 to +31,250 (specified with a signed integer)
UM 00188 UM 00189 UM 0018A UM 0018B UM 0018C UM 0018D UM 0018E UM 0018F	Holding min. value	K0	The acquired minimum value will be held when the maximum and minimum value holding function is used. Setting range: -31,250 to +31,250 (specified with a signed integer)

(Note) The unit memory numbers in the above table are listed for CH0 to CH7 in numerical order.

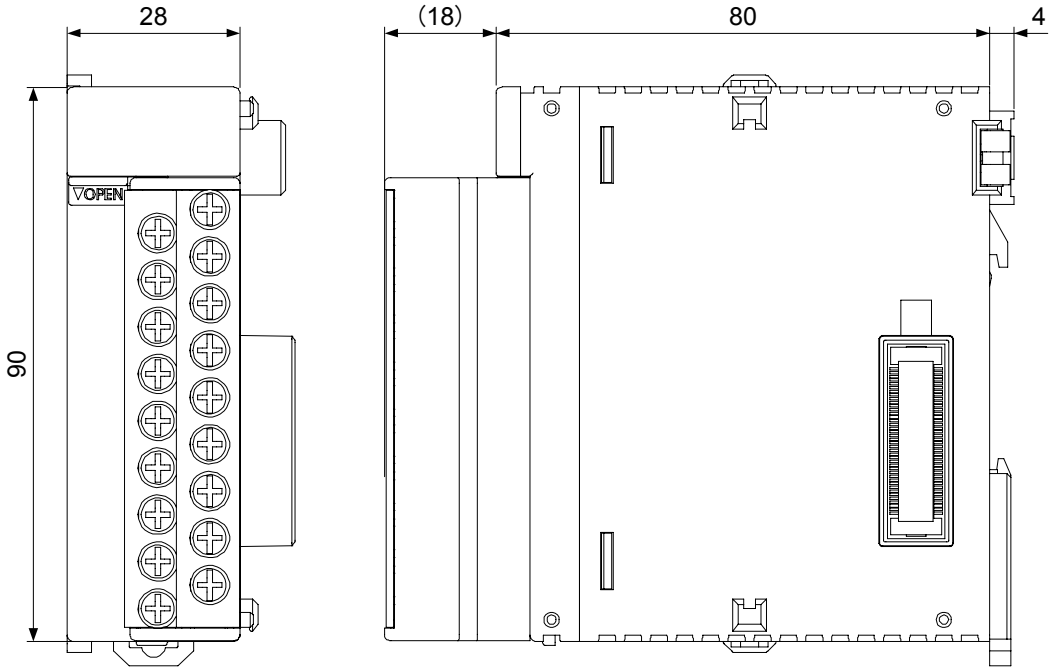
■ **Buffer data storage area per channel (AFP7AD4H)**

Unit memory number (Hex)	Name	Default	Setting range and description
UM 00800 to UM 02F0F	CH0 Buffer area	K0	Stores buffer data when the buffer function is used. 10,000 words per channel Setting range: -31,250 to +31,250 (specified with a signed integer)
UM 03000 to UM 0570F	CH1 Buffer area	K0	
UM 05800 to UM 02F0F	CH2 Buffer area	K0	
UM 08000 to UM 0A70F	CH3 Buffer area	K0	

■ **Buffer data storage area per channel (AFP7AD8)**

Unit memory number (Hex)	Name	Default	Setting range and description
UM 00400 to UM 0233F	CH0 Buffer area	K0	Stores buffer data when the buffer function is used. 8,000 words per channel Setting range: -31,250 to +31,250 (specified with a signed integer)
UM 02340 to UM 00427F	CH1 Buffer area	K0	
UM 04280 to UM 061BF	CH2 Buffer area	K0	
UM 061C0 to UM 080FF	CH3 Buffer area	K0	
UM 08100 to UM 0A03F	CH4 Buffer area	K0	
UM 0A040 to UM 0BF7F	CH5 Buffer area	K0	
UM 0BF80 to UM 0DEBF	CH6 Buffer area	K0	
UM 0DEC0 to UM 0FDFF	CH7 buffer area	K0	

8.5 Dimensions



Record of changes

Manual No.	Date	Record of Changes
WUME-FP7AIH-01	Mar.2013	1st Edition
WUME-FP7AIH-02	Aug.2014	2nd Edition - Added new model AFP7AD8 - Error correction

Please contact .....

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